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Design in Fretwork for Panel, Border, Corners, etc.

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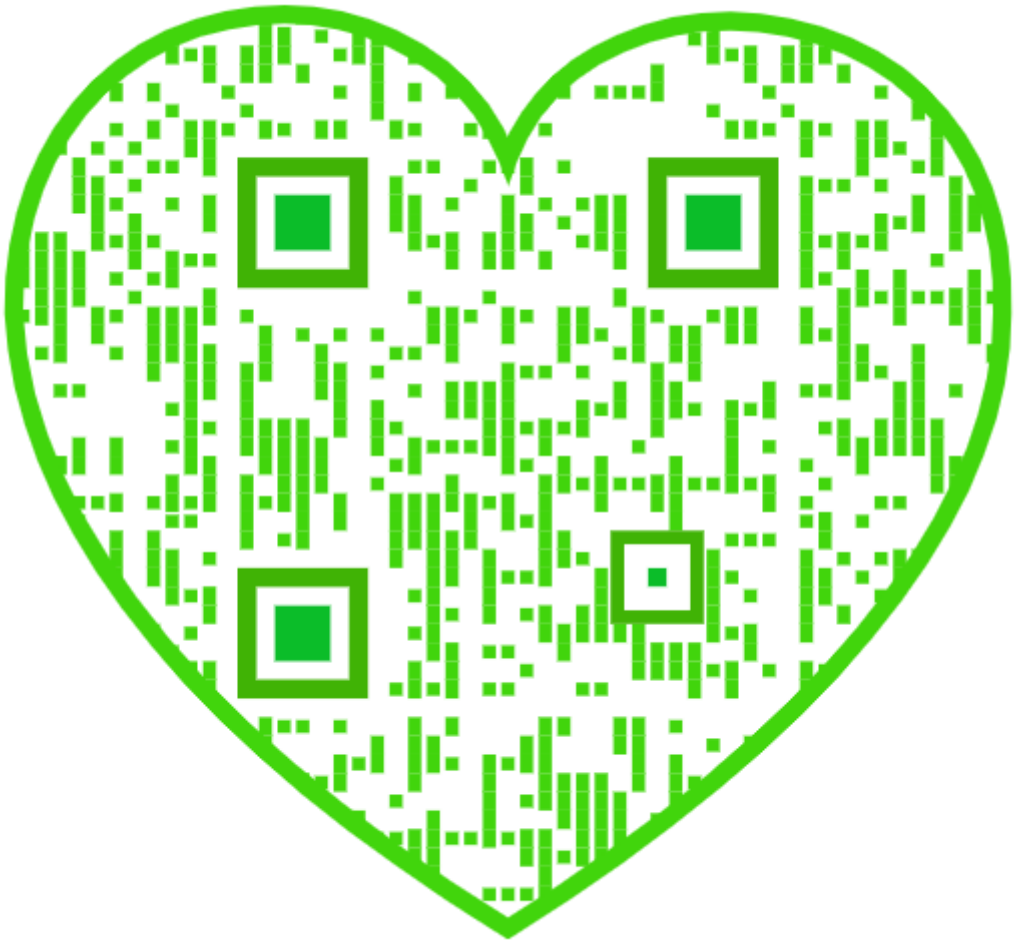


DESIGNS FOR PANELS, ETC., IN FRETWORK.

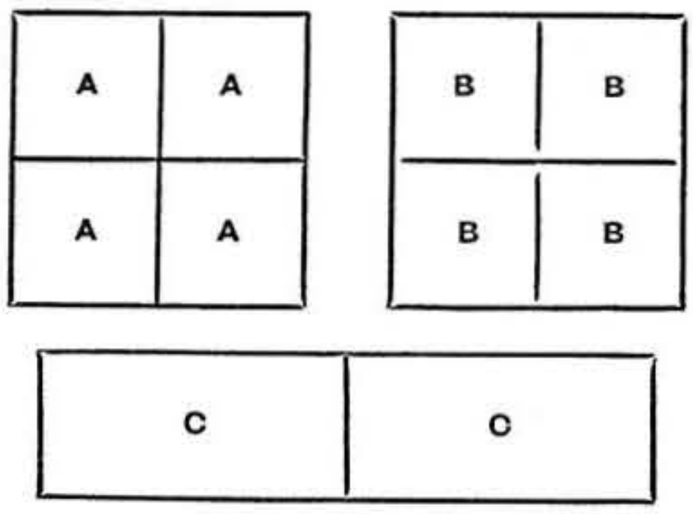
BY J. EADIE REID.

Of all productive amusements, illumined by the cheery glow of a winter's night fire, there is none, perhaps, more "fascinating and profitable" than fretwork. The numerous articles, both useful and beautiful, adorning the walls of our pet rooms and filling their corners are rich in memories of such evenings.

In my sketches in the preceding page, I have striven to supply range for such employment, and trust that while affording scope for technical skill, the sketches will illustrate my theory as to the fitness of the design to the material. This is a point which cannot be insisted upon too emphatically.

Without in any way wishing to depreciate designs published for fretwork—and many are of exceeding beauty—I do think that a great deal of energy is wasted over work more fit for shadow pantomimes rather than decoration.

The drawings given are capable of being repeated, as shown in the following diagrams. The border design might be utilised as a frame or back of pipe-rack, etc.



Fretwork can also be applied to metal work. I have seen a very charming stove cover executed in this way, the design being modelled in repoussé. Finger-plates might be carried out in this method, and the inventive minds of our readers will suggest other outlets.

PRACTICAL PAPERS FOR SMITHS.

BY J. H.

Hardening and Tempering.

The Term Steel—Carbon in Steel—Mr. Seebohm's Classification—Secondary Agents—Definitions—Hardening—Tempering—Annealing—Hammer Hardening—Chisel Tempering—Tempering on a Bar—Grades of Temper—Colours—Effect of Steam—Warping and Cracking—Correcting Crooked Work—Thick Edges—Hardening Agents.

The Term Steel.—No confusion need arise in our minds as to the proper application of the term steel. For our purpose we shall only consider the two broad divisions into mild steel that will not harden and temper, and high carbon or crucible steel that will harden and temper. Steel castings, with which we are not concerned, will not harden at all.

Carbon in Steel.—The purer the mild steels—that is, the nearer they approach to the condition of malleable iron—the more ductile and the more weldable they are. On the other hand, their capacity for hardening and tempering diminishes. Carbon is the principal hardening element. Yet in no case does the proportion in which it is met with equal that in cast iron. In steel it seldom or never amounts to more than 1·5 per cent. It is as low as ·1 per cent. in the mildest plates.

Mr. Seebohm's Classification.—Mr. Henry Seebohm, a Sheffield manufacturer of eminence, read a paper a few years ago at the Chester meeting of the Iron and Steel Institute. In that he very happily likened hardened steel to glass, annealed steel to lead, and tempered steel to whalebone. He gave a list in that paper of the most useful kinds of steel, regarded from the standpoint of temper. I need not apologise if I make use of that list in this article.

Razor temper (1½ per cent. carbon).—This steel is so easily burnt by being over-heated that it can only be placed in the hands of a very skilful workman. When properly heated, it will do twice the work of ordinary tool steel for turning chilled rolls, etc.

Saw-file temper (1⅜ per cent. carbon).—This steel requires careful treatment, and although it will stand more fire than razor steel, should not be heated above a cherry red.

Tool temper (1¼ per cent. carbon).—The most useful temper for turning tools, drills, and planing-machine tools, in the hands of ordinary workmen. It is possible to weld cast steel of this temper, but only with the greatest care and skill.

Spindle temper (1⅛ per cent. carbon).—A very useful temper for circular cutters, very large turning tools, taps, screwing dies, etc. This temper requires considerable care in welding.

Chisel temper (1 per cent. carbon).—An extremely useful temper, combining as it does great toughness in the unhardened state, with the capacity of hardening at a low heat. It is consequently well adapted for tools when the unhardened part is required to stand the blow of a hammer without snapping, but where a hard cutting edge is required, such as cold chisels, hot setts, etc.

Sett temper (⅞ per cent. carbon).—This temper is adapted for tools where the chief punishment is on the unhardened part, such as cold setts, which have to stand the blows of a very heavy hammer.

Die temper (¾ per cent. carbon).—The most suitable temper for tools where the surface only is required to be hard, and where the capacity to withstand great pressure is of importance, such as stamping or pressing dies, boiler cups, etc. Both the two last tempers may be easily welded by a mechanic accustomed to weld cast steel.

Secondary Agents.—In addition to carbon, but in a lesser degree, manganese, phosphorus, and silicon are hardening constituents of steel. Within certain limits, the more these hardening constituents are present in steel, and the lower the temperature of the cooling liquid employed, and the greater its power of absorbing heat, the more intense will be the hardness induced in the steel. Mushet steel, used for turning tools, is produced by the addition of wolfram or tungsten, in the form of a metallic alloy, to steel. The resulting alloy is so hard that it does not require to be hardened by the tool maker.

Definitions.—My technical friends will pardon me if I explain, in the interests of the "general reader," the meaning of three common terms that will be frequently used in this and in the next article. They are "hardening," "tempering," and "annealing."

Hardening.—The process of hardening, as commonly understood by smiths, means the heating of a piece of steel to a high temperature—a full red, or a cherry red—and plunging it at once and completely into a cooling liquid, either water or oil, pure or medicated. This causes the steel to become hardened—as hard as it is possible for it to be made.

Tempering.—Tempering means that the steel is re-heated to a temperature very considerably below its previous heat, and when at a certain precise temperature, indicated by a definite shade of colour, it is plunged into a cooling liquid, or in some few cases is allowed to cool gradually in air. This grade of tempering is different in the case of almost every tool or piece of mechanism.

Annealing.—If the steel is heated to a high temperature, usually above that required for tempering, but below that for hardening, and allowed to cool slowly in air or in ashes, the steel is then said to be annealed. Steel may be annealed by getting it red hot, and allowing it to cool between hot cinders. Or it may be left in a low fire until the fire has gone out and the cinders have become cold. Or it may be enclosed in a box with charcoal powder, raised to a red heat, and allowed to become cold.

In the first case, therefore, the steel is brought into a condition intensely hard, like glass; in the second, into one softer and less brittle than the first—the whalebone condition—but yet as a rule very hard; in the third, it is in its softest possible condition, akin to that of lead.

Hammer Hardening.—Hardening by means of hammer blows is of occasional service when it is desired to increase the elasticity and hardness of a plate or lamina of steel. Its effect is similar to that of cold rolling and of wire drawing, and is removed by annealing. If hammer hardening is prolonged too far, the metal becomes fractured; hence, annealing must be resorted to before this stage is reached. The range of temper obtainable in hammer hardening is not so great as in the ordinary method of heating and quenching in water, and it has a more limited value, being confined chiefly to laminated springs.

Chisel Tempering.—The typical method by which much work in the tool line is tempered is this: Say the article is a cold chisel. The scale is removed from the surface, as it must be from all work that has to be hardened. It is then first heated to a cherry red in a clear fire—just the cutting end only—to the length of about a couple of inches, and is then quenched in water. It is taken out and rapidly brightened with a bit of grindstone or emery, in order that the rapidly changing hues may be observed the better. Though the cutting end has been cooled in the water, it is only for an instant, for the heat of the shank at once begins to be communicated to that end, and raises its temperature, until the instant arrives at which it must be quenched for tempering. The smith then plunges the entire chisel into the water, moving it to and fro until quite cold. The colour for tempering in the case of a cold chisel is a deep straw inclining to purple. But, as I cannot too often reiterate, the colour must vary with different grades of steel.

Tempering on a Bar.—Another way suitable for many small tools is to heat a bar of iron to redness in the forge fire, and lay the tools upon the bar until they reach the colour required for quenching. If the bar is made red hot at one end only, the tools can be gradually slid along toward that end, and so slowly heated thoroughly through,

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until they reach the precise tint for tempering.

Grades of Temper.—But all cutting tools of the same type are not tempered alike. Thus, turners' roughing tools or fitters' chisels will be tempered at different shades of colour, according to the material they are specially intended to operate upon. A tool for working hard cast steel will be made harder than one for working grey cast iron. A tool quenched at a straw colour is harder than one quenched at a blue; so that if tools for hard steel are tempered at a straw, those for soft iron and brass are tempered at a tint between straw and, say, purple.

Colours. — The main colours through which steel passes from the lowest to the highest temperature are straw, gold or yellow, chocolate, purple, violet, and blue. These, with their intermediate shades, are the indications of the temperatures for quenching for different tools.

Effect of Steam.—During quenching the steel should not be allowed to remain still, but be moved about. There is an important reason why steel should be moved about in the water during hardening. Water in contact with red-hot metal assumes the spheroidal state, and prevents perfect contact between the surface of the metal and the cold water. Moving the steel about, therefore, assists in maintaining a more perfect contact by bringing it into colder strata. This also is the reason why, when hardening large masses, such as the faces of anvils, the practice is to pour a stream of water over them. For the same reason, mercury is a better hardening agent than water. Plunging small articles into cold lead or into tallow, or placing them between cold iron, are for the same reason perfect methods of cooling, there being no formation of steam. Further, sharp angles should be carefully avoided in work that has to be hardened. They invite cracks just as similar sharp angles do in castings.

Warping and Cracking.—Hardening steel often causes it to become cracked and warped out of truth, though no sharp angles are presented. The reason is this: On dipping the steel into the cooling medium, the outer covering is rapidly cooled off first, and shrinks upon the interior. The shrinkage puts the outside into tension. Presently the interior cools. But it is prevented from free shrinkage by its union to the set exterior, and is thus itself put into tension, so that two things may happen: either there will be a condition of permanent tension, productive of warping or curvature, or the stresses will find relief in fracture. And this is why hardening is so apt to curve or crack the object. And since the effect of water hardening is more pronounced than that of oil or tallow hardening, it is customary to use oil or tallow in preference to water in all delicate works. Moreover, in order to lessen the liability to curvature, long narrow articles are immersed perpendicularly instead of horizontally or diagonally in the fluid, so that its effect may be evenly distributed over the whole of the surface. Again, steel that is taken out of the water before being thoroughly quenched is apt to crack. And steel is apt to crack at the water level if kept at the same height. It should therefore be moved slightly up and down in the water. When dipping articles of unequal thickness on the edges, the thicker edge, as a rule, should be dipped first, to lessen risk of cracking.

Correcting Crooked Work.—Thin work that goes crooked during tempering may often be corrected after hardening, and while at the heat for tempering, with a cross-pane hammer, operating on the concave face.

Thick Edges.—When tempering cutting tools, the edges should invariably be left thick, to be reduced afterwards by grinding. If tempered thin, the edges will be liable to be burned, and if not burned, the temper of the edge will not be the same as that of the thicker portion. But if tempered thick and then ground down, the temper will be uniform throughout.

Hardening Agents.—Almost every smith has his favourite hardening agents. The principal are cold water, medicated in various ways, chiefly with salt, and also lukewarm water, and oil. Mercury has been used and recommended, and since it is a good conductor, and no film of steam can form between it and the work, it should be very efficient. But of course its expense precludes its use for average work, and we may dismiss it at once. For most purposes of the ordinary smith, pure cold water only is used. For light and delicate work, however, oil is preferable. In the next article I shall write at length on the principal fluids and mixtures made use of.

SOME LESSONS IN WINDOW MAKING.

BY G. LE BRUN.

Roof-lights and their Construction.

When the worker has mastered the "setting-out," mitring, and putting together of an ordinary dead-light, or fixed sash, he will be the more competent to try his hand at the making of roof-lights, which, although to many they appear more difficult, are in reality easier to make than a sash having cross-bars. For the sake of an example, we will suppose that we have to make the roof-lights for a greenhouse similar to that described in the paper on "The Tenant's Greenhouse," in Work, Vol. I., page 177. We will thus have a definite object to take the sizes from, and the lesson may prove doubly useful to those who are at work on the house there described.

Turning back, then, to Vol. I., page 177, we find that to cover in the roof four sashes are required. In an erection intended for a permanency, two roof-lights extending the whole length of the building would be the proper mode of construction; but, as in the case before us, portability is an object of importance, the roof-lights are made in four sections (two for each side), so as to allow of ease in handling when taking down or erecting. The number, however, is immaterial—four will do as well as two for our lesson—as the difference after all is only in the respective sizes of the sashes, and does not in the least affect their mode of construction.

We require, then, four roof-lights, each 5 ft. 10 in. high and 6 ft. 2 in. wide, and for these we shall want material as follows:—Eight stiles, 6 ft. 2 in. by $3\frac{1}{2}$ in. by 2 in.; four sole rails, 6 ft. 3 in. by 5 in. by $1\frac{3}{8}$ in.; four top rails, 6 ft. 3 in. by 3 in. by 2 in.; sixteen sash-bars, 5 ft. 11 in. by 2 in. by $1\frac{1}{4}$ in. These are the sizes in the rough, allowance being made in the lengths for stumps on the stiles and tenons. Prepare the wood carefully by planing up straight and square, and pay attention to the running of the grain in the direction in which the planes run when rebating and moulding, as explained in the previous lesson on dead-lights.

Take the stiles first, and lay them on the bench, in pairs, alongside each other, the marked or inside edge being uppermost. Lay a sash cramp across them, and tighten it up sufficiently to prevent the stiles slipping away from each other; put a bit of wood between each jaw of the cramp to prevent marking the material, and keep it up far enough above the edges to allow of your rule passing beneath when measuring, taking care also that the ends of the stiles are flush. Draw a line across the stiles 2 in. from the left-hand end, measure off 5 ft. 10 in., and draw another line across. The distance between these lines is the height of your sashes (A, A, Fig. 1). Now at the left-hand end measure off from your first line 5 in., and at the right-hand end 3 in. These are the widths respectively of the sole and top rails (B, B, Fig. 1). Let the top rail have a rebate of $1\frac{1}{4}$ in., and the sole rail 2 in. (C, C, Fig. 1). The distance between the lines, C, B, is the length of the mortises, and you will notice that at the sole end of the stiles they are continued to the full width of the rail, the part extending from A to C, however, being only $\frac{5}{8}$ in. deep. This is to allow for the insertion of the piece of tenon left on to steady the rail, and also to prevent leakage. This piece, with mode of cutting the tenon of the rails, is shown in Fig. 4.

Turn the stiles upside down, and draw across the lines, C, B, on the back edges, leaving an allowance of $\frac{1}{4}$ in. at each side of the mortises to allow of the insertion of the wedges. In turning the stiles over, get the assistance of another person, each holding the ends tightly, so that they may not slip away from each other endways; if you attempt to turn them yourself by lifting them in the middle, the probability is that you will drop them, or shift all your marks away from each other. Set the mortise gauge for a $\frac{5}{8}$ in. chisel, and run it, as in the previously described sash, $\frac{11}{16}$ in. from the face. Take the top rails, and lay them on the bench face edge upwards; draw a line $\frac{1}{2}$ in. from the left-hand end, measure off 6 ft. 2 in., draw another line across, and you have the extreme width of your sashes marked. From these lines (A, A, Fig. 2) measure off at each end the width of the stiles ($3\frac{1}{2}$ in.), and square across the marks (B, B, Fig. 2) again; from these last marks measure outwards towards the ends of the rails $\frac{5}{16}$ in., and again square across your marks. These last marks (C, C, Fig. 2) are those you square over the sides for the shoulders of the tenons, and you will notice that, unlike the shoulders of the previously described window rails, both sides are alike, thus forming a square shoulder; the reason of this is that you may have a deeper rebate for the glass, which is an advantage in roof-lights, as it gives a better bed, and tends to prevent leakage. Before, however, you begin to square your shoulders over you must divide the rail into five equal parts, and draw the mortises for the bars. These mortises are $1\frac{1}{4}$ in. long; you had better keep them a little tight, say $1\frac{3}{16}$ in., as loose bars are an eyesore to the good workman. Let the two centre bars be mortised through the rails; the other two merely require letting in about 1 in.

The sole rails, which are next in order, are drawn across the top edges in a similar manner to the top rails, the same mark being taken for the shoulder (C, C, Fig. 2), which on these rails is only on one side—that is, the underneath one. You need not do your measuring over again; it is easier, and also more accurate, to lay a top rail on your sole rails and mark off the various points for shoulders and mortises. You cannot use your mortise-gauge on these rails for the tenons, so you must set a marking

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gauge to $\frac{5}{8}$ in., and run it from the back of the wood, which ought to be accurately thicknessed to $1\frac{5}{16}$ in. The mortises are also different, as will be shown presently.

The bars are cut with a square shoulder at the top end, the lower end being cut as in Fig. 3. A $\frac{5}{16}$ mortise into the rail about an inch is sufficient. Of course, you must allow the $\frac{5}{16}$ longer at each end for the mitring into the mouldings of the rails.

When all the stuff is set out, mortised, and tenoned, it is rebated and moulded in the usual way; the rebate, as before mentioned, is of the same depth as the moulding, and this must be seen to carefully, for if both are not of the same depth the joints will not be close on both sides of the work when down through them. Nail the ends of the other two bars in the same way, cut off the stumps of the stiles and tenons, and plane up all round, and your roof-light is finished and ready for putting in place.

I have said nothing about the wood to be used, as that depends on the ease with which it can be got, and the amount of money to be expended. Yellow deal is easily worked; red deal and pitch pine are much preferable, but more expensive, and in remote places are sometimes not easily procurable; but whatever wood is used let it be as free from knots as possible, and I would say avoid using white pine if you can help it.

Two coats of white-lead or other priming paint had better be given the roof-lights

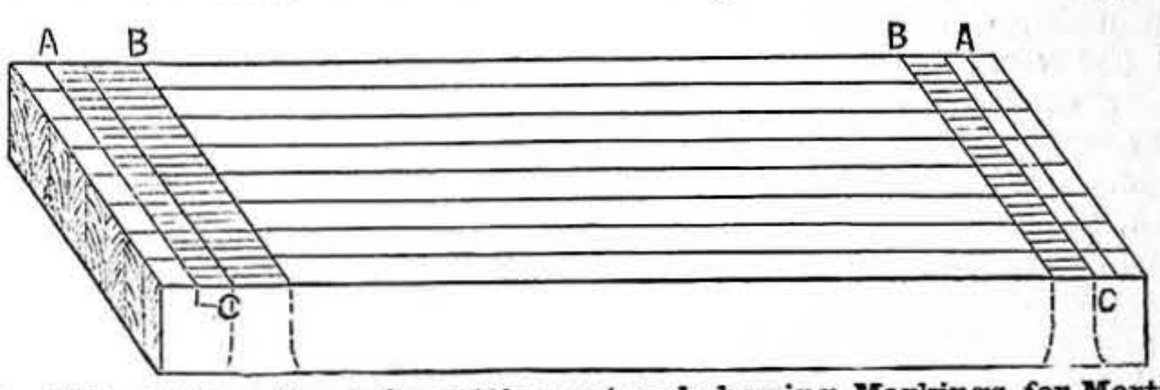

Fig. 1.—Stiles laid on Bench for setting out and showing Markings for Mortises.

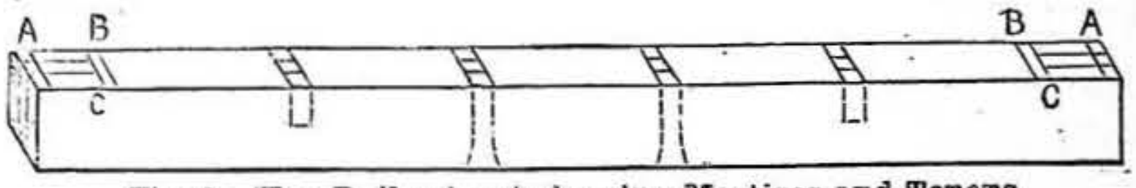

Fig. 2.—Top Rail set out showing Mortises and Tenons.

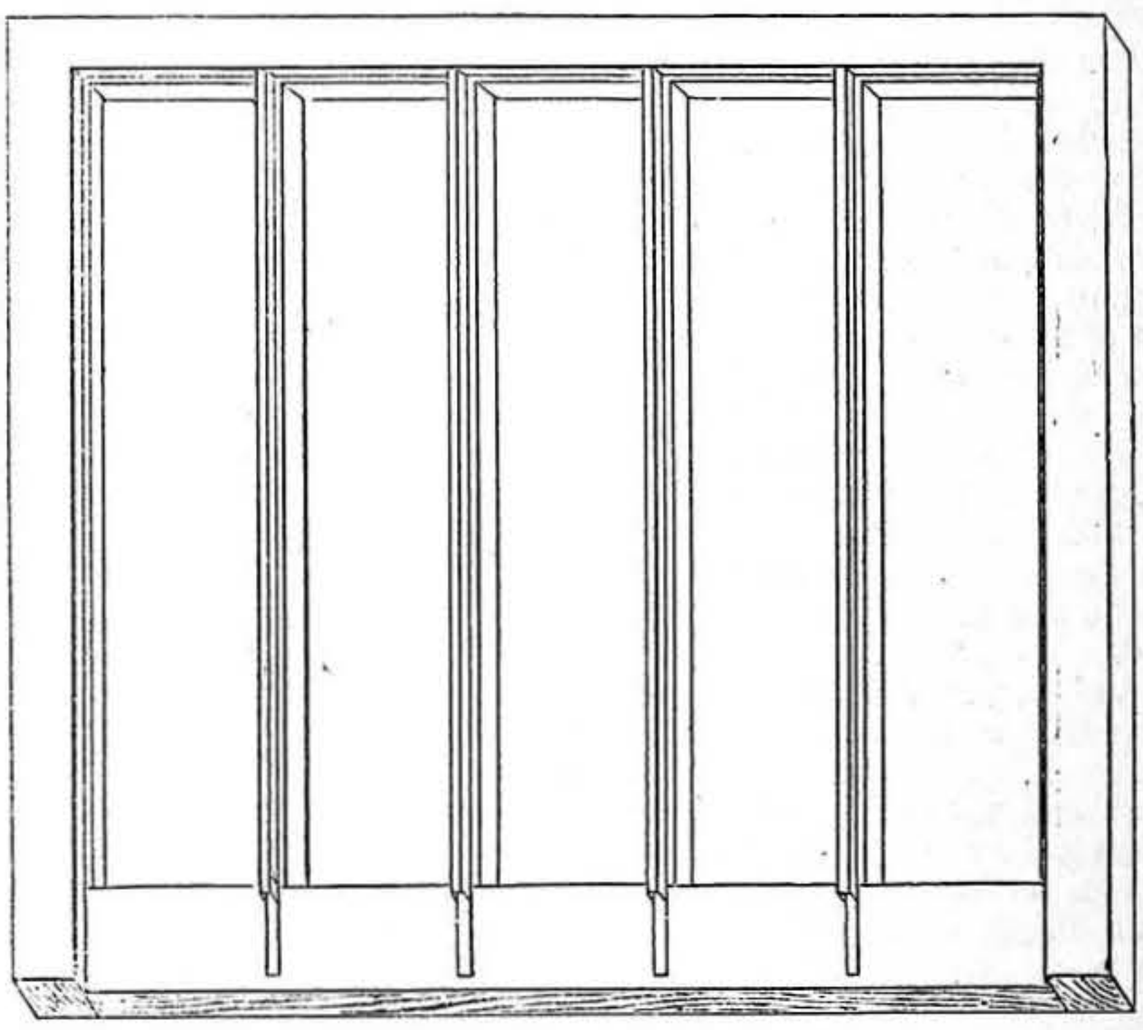

Fig. 7.—Roof-light completed.

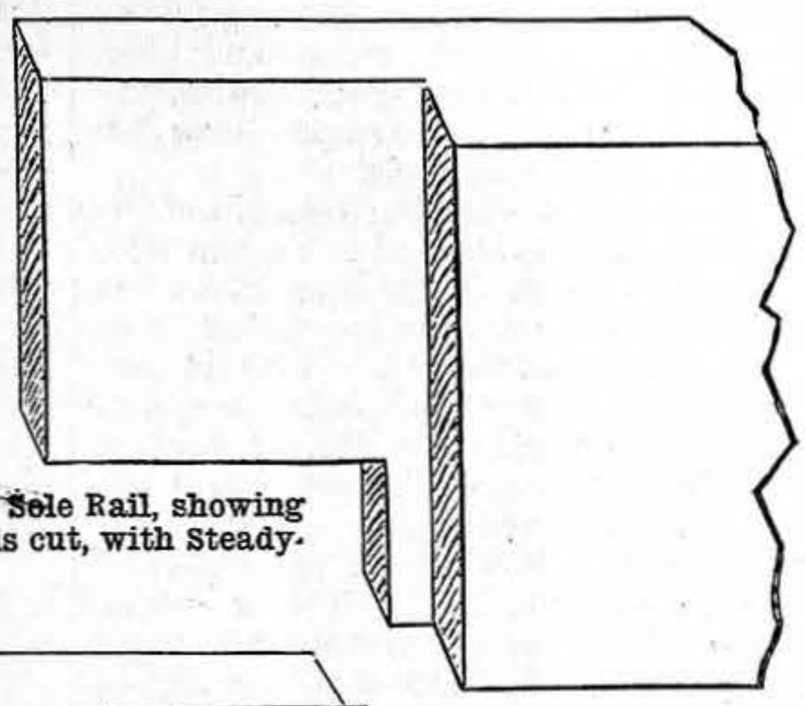

Fig. 6.—End of Sole Rail, showing how Tenon is cut, with Steadying Piece.

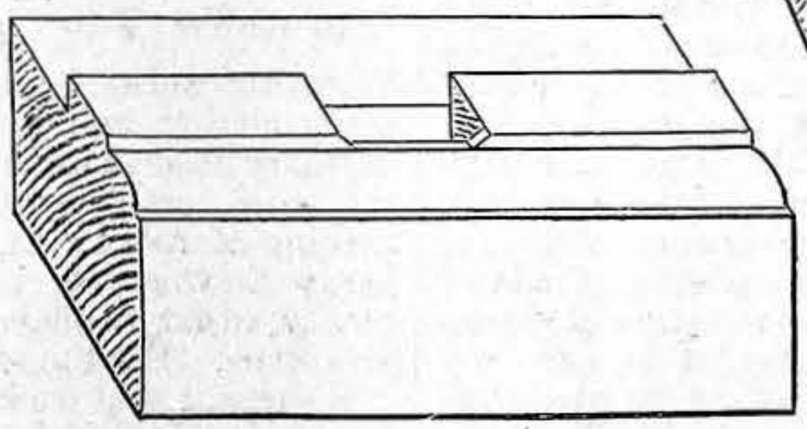

Fig. 5.—Diagram showing Mortise with Mitre to receive Top End of Tenon.

Fig. 3.—Section of Sole Rail, showing Mode of mortising and fixing.

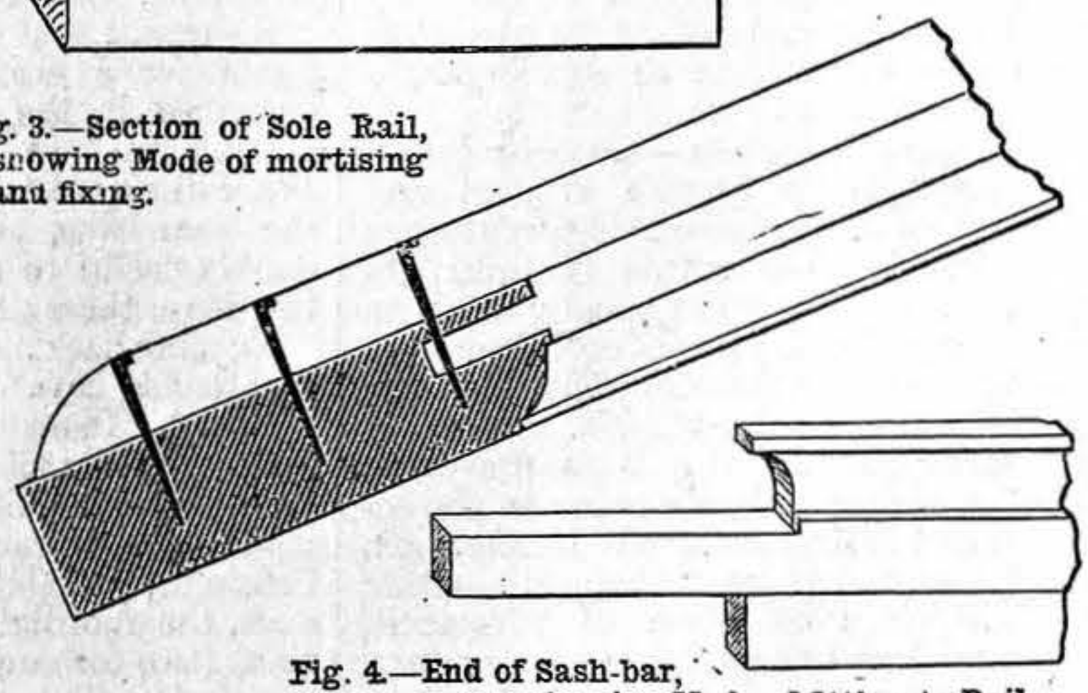

Fig. 4.—End of Sash-bar, showing Mode of fitting to Rail.

finished, and may give rise to twisting of the sash, or breaking of the tenons under the cramping-up pressure.

The mode of mitring the rails and stiles is the same as in the previously described dead-light; the bars, however, are a little differently managed, as will be seen by referring to Figs. 4 and 5, which show the end of a bar cut and mitred, and its corresponding place in the rail. The upper edge of the sash-bar, it will be noticed from Fig. 3, runs over the sole rail, and terminates within $\frac{1}{2}$ in. of its lower edge, where it is rounded off. This rounding should be done after the sash is cramped up. When putting the framing together, wedge up and pin the stiles in the usual way, then reverse the cramp by laying it across the rails in the centre. Wedge up the tenons of the two bars that go through the top rail, also pinning them, and nail the lower ends down firmly to the sole rail by driving three $1\frac{1}{4}$ in. stout brads before they are put in position; they can then be glazed and have a finishing coat of paint. Of course, the priming can be done if necessary when they are up, but it is a much easier operation to do it while they are on the ground and easily got at.

Forcing-frame sashes are made in the same way as roof-lights, but generally on a smaller scale, and no moulding need be worked on them; in fact, it would be lost labour to do so, therefore the under sides of the framing can be left square, allowance being made for that in the shouldering of the tenons.

In making long stretches of roof-lights, such as in nursery greenhouses or on factory roofs, a different mode of structure is adopted; the top and bottom rails running the entire length of the roof are fastened to the rafters, and the stiles and bars fitted into their several places *in situ*. Mortising and tenoning are dispensed with, except the top ends of the bars, which are generally put into mortises in the top rail, the lower end being rebated into the sole rail, and nailed firmly down. In some instances the rafters themselves are utilised as bars, and rebated on the upper edge for the reception of the glass, the top and bottom ends of the panes being rendered water-tight by an arrangement of lead or zinc. In fact, every locality and every builder have different ways of doing the work, differing, however, only in minor details, the principle being the same throughout; so that the worker who masters the construction of the roof-lights described in this paper will have learned a useful lesson, and once having grasped the general idea of how the work is done, the alteration of minor details to suit any particular requirements is only a matter of thought on his part. In a future paper I will endeavour to deal with some of the intricacies of window making of a more complicated nature, and show how to put together a hung sash with its case.

MAKING THE BEST OF A BAD HOUSE.

BY MARK MALLETT.

THE STUDY: WOODWORK OF THE FIREPLACE—OLD OAK — INCISED CARVING — THE CHIMNEY CORNERS—THE OUTER MANTELSHELF.

The Study: Woodwork of the Fireplace.—When the mason had set the grate and (under my direction) fixed the tiles round it, he was, I found, much exercised

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in his mind as to the possibility of my ever making my fireplace presentable. His trade traditions as to the way in which things ought to be done had been outraged, but for my own part I saw no special difficulties.

First, round the tiles I fixed a casing of ebonised pine, and on its face a strip of moulding, the inner edge of which projected just so far as would cover any inequalities in the edges of the tiles, for, being an odd lot, they did not, of course, finish in a straight line. This casing projected some

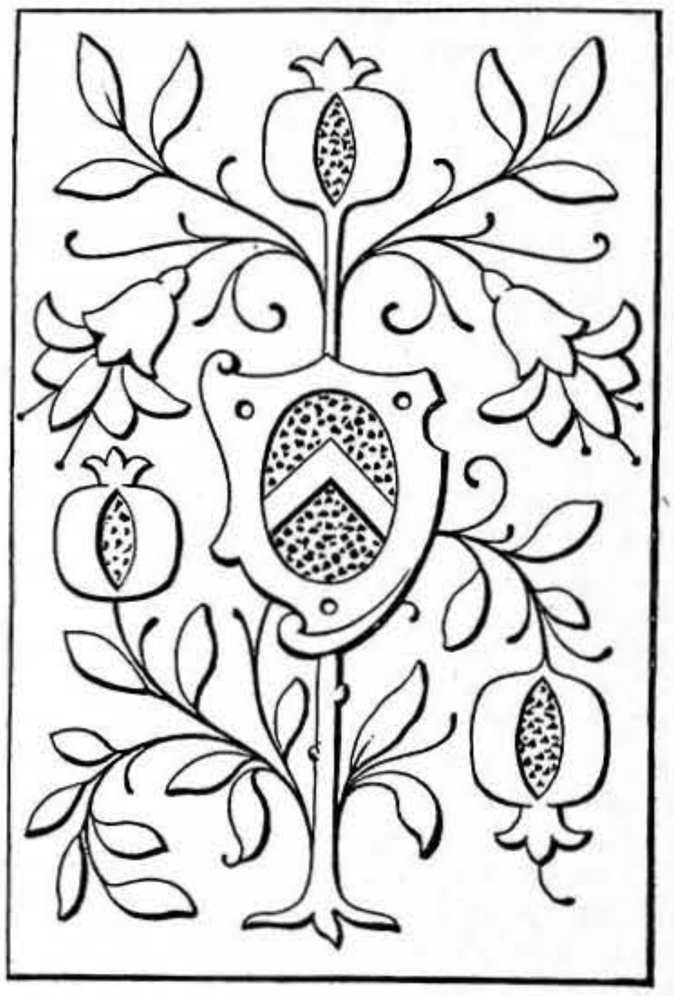

Fig. 5.—Panel: Pomegranate Conventionalised.

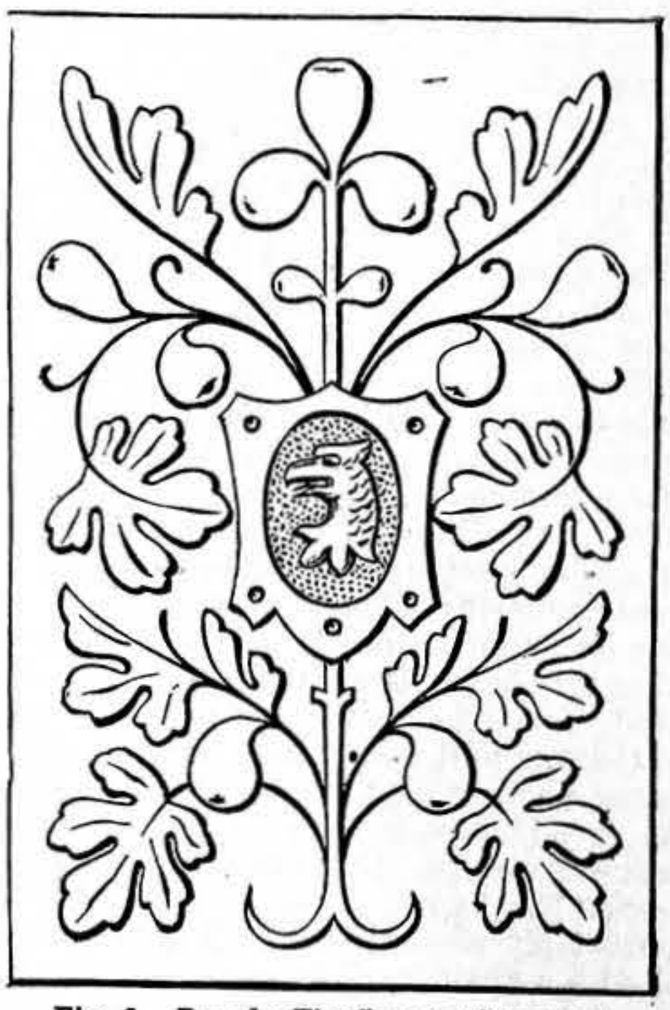

Fig. 6.—Panel: Fig Conventionalised.

3 or 4 in. from the wall, but I did not, as will be seen from Fig. 1 (page 449), rest my mantelpiece immediately upon it. Over it I arranged the groups of brackets shown, and rested the shelf on them. This gave me some handy little nooks, useful for laying things, beneath the shelf. In Figs. 2 and 3 the brackets are enlarged; they, like the mantelpiece itself, and the casing of the chimney-breast on each side, are of ebonised pine. Above the mantel-shelf all is dark oak. Ebonised wood, be it remarked, goes well with the colour of old oak. In this room a great many odds and

Fig. 4.—Incised Panel for Mantelpiece.

ends of the last-named material are used up, but to have employed new oak to supplement them in every part would have been a costly and difficult matter. I therefore eked them out with the more cheap and easily worked wood, and this wrinkle of my own finding out I can commend to others as worth their consideration. I ebonised with decoction of logwood chips, used hot, and iron dissolved in vinegar, polishing with beeswax and turpentine.

Old Oak.—In the decorative work above the mantelpiece, the two demi-figures which occupy the sides are old Jacobean carving—part of the wreckage, probably, of some demolished bedstead—but the panelling between them, though old in itself, is of my own decorating. When I began my work on this house I had by me an accumulation of odds and scraps of old oak-work, some carved, but more without carving. In country places, when old houses are pulled down and churches "restored," it is easy, if anyone will keep his eyes open, and take care to be on good terms with such of his neighbours as are in the building trade, to get such matters for a mere old song. This I commend to the reader as another wrinkle.

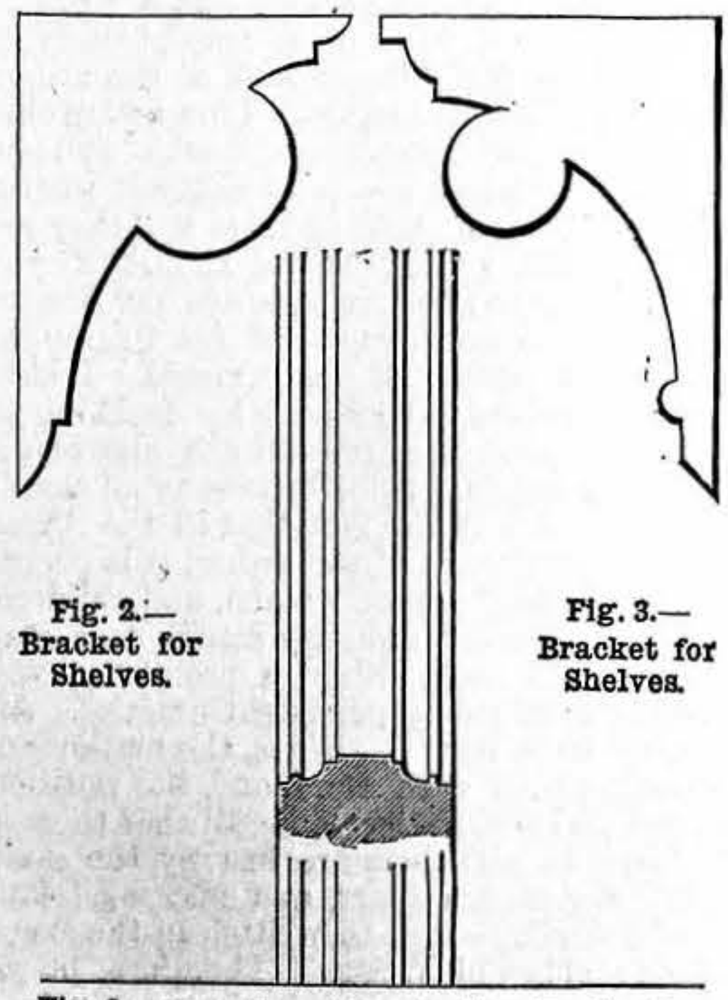

Fig. 2.—Bracket for Shelves.

Fig. 3.—Bracket for Shelves.

Fig. 9.—Framing of Panel, showing Section.

But to return to the overmantel. The decoration on the panels in question consists of little more than incised lines, a kind of work about which I should like to say a few words.

Incised Carving.—When setting about the decoration of a whole house, or even of a single room, the amateur wood-carver finds the need of quicker methods than when merely ornamenting some small fancy article, and in the manner before us a number of panels, whether new or old, may be enriched in a comparatively short time. In

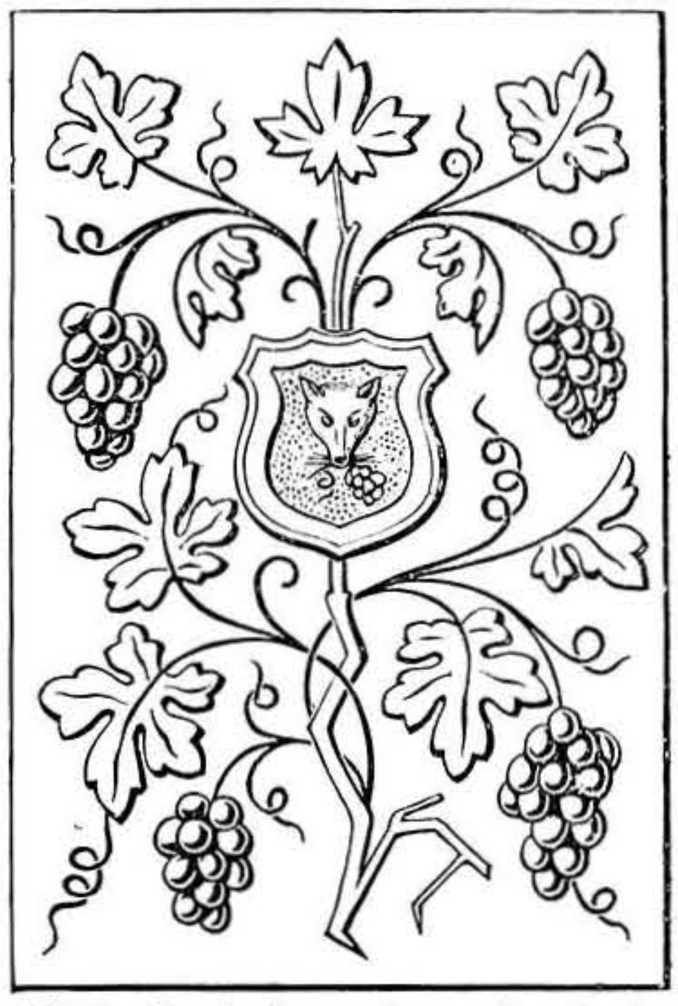

Fig. 7.—Panel: Grapes Conventionalised.

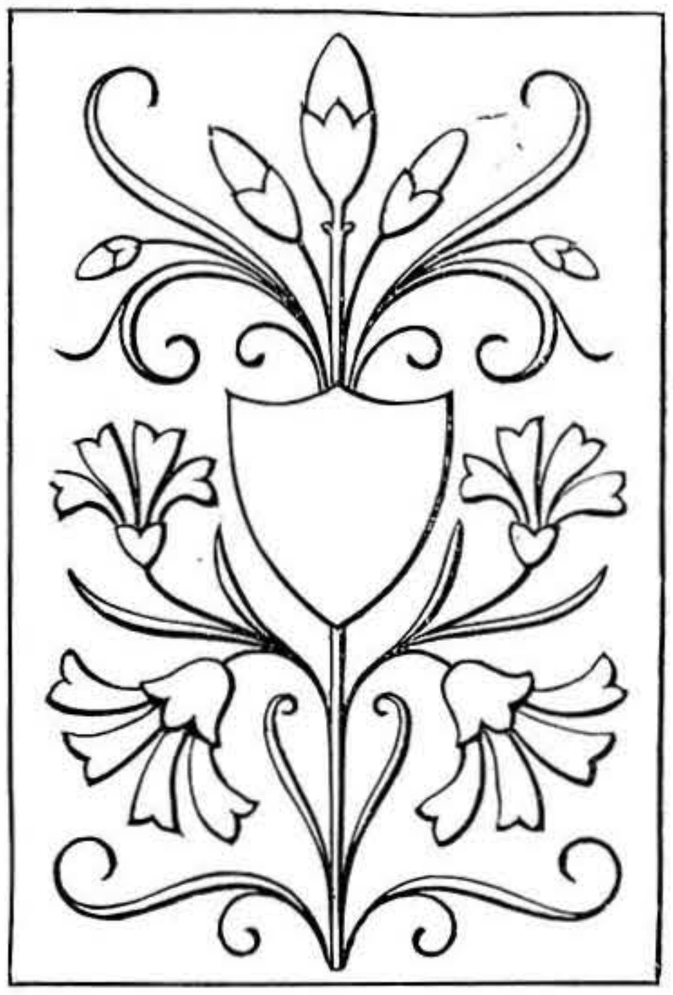

Fig. 8.—Panel: Carnations Conventionalised.

Fig. 4, one of these panels is shown drawn to a larger scale. Except where, as on the shield, the grounding-punch is used to give the effect of relief, almost the entire work is done with the dividing-tool. For this purpose I find that a leaden dummy drives the tool best. A very rough indication of the pattern only is required, as it is easier to get a good flow of line with the tool than with the pencil. One can vary these lines so much in depth and strength as to put a great amount of expression into them.

The design of Fig. 4 is very much a fanciful one, but in Figs. 5, 6, 7, and 8, I have designed other panels which the reader may

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like better for carrying out, and in which natural growths are conventionalised; Fig. 5 is the pomegranate, Fig. 6 the fig, Fig. 7 the grape, and Fig. 8 the carnation. In Fig. 7 the grapes will better be defined with a gouge than with the dividing-tool.

The Chimney Corners.—The panelling which lines these is old stuff: the diamond pattern with which the panels are worked was a favourite one in early Stuart times. So much of the panelling as appears in Fig. 1 is a portion only of a large piece of wainscoting, which I got from a builder at the pulling down of an old house for 5s. Below this panelling appears a base of plain, ebonised wood, which does not assert itself in the drawing, but in the actual thing throws up and sets off the carving remarkably well.

To the left will be seen a corner-seat, with a carved front. The actual seat is one solid block of stone, which I have thus cased. What is now its front served as the front of a box in the days of James II., but came to me as a fragment with other fragments. The footstool below, I may, for the benefit of fellow-smokers, mention aside, is a disguised spittoon. On the jamb to the front of the seat another adaptation of old wainscot may be seen. In this the gouge-work at the top only is of the date of the panels, the lower carving having been added by myself to match the old work in the corners.

The Outer Mantel-shelf.—Over the wide opening to my old-fashioned hearth ran a huge, unsightly beam, which had, in the course of ages, been plastered over with innumerable coats of white and coloured washes. Along its front was nailed a mean, painted shelf, such as one commonly sees in such situations in farmhouse kitchens, the acknowledged receptacle for candlesticks and similar matters. This shelf I removed, and, having scraped and cleaned the beam, I bevelled off its front edge, planed it, and rubbed it over with boiled oil. It was of elm, but, through age and smoke, showed, when dressed, scarcely lighter than my old oak. Against it, but some inches higher than its predecessor, I fixed a new shelf of ebonised pine (as seen in Fig. 1). It is supported by brackets similar to those shown in Figs. 2 and 3, and between them are carved shields, with armorial bearings. For these last, which can be applicable in my own case only, I have in the drawing substituted fanciful devices of sun, moon, and stars. All the woodwork of this shelf, except the shields, was screwed together before fixing up; it was then screwed to the beam and the screws hidden by the shields.

HINTS ON THE STRINGING OF THE ZITHER.

BY AN OLD TEACHER.

As R. F. has given us a splendidly lucid set of instructions as to how to construct a zither, it is a pity that he has not adhered to the conventional form of the solo instrument, especially as his dimensions appear to be exact for that description. The straight and ungraceful shape he gives is that chosen for the "Élégie," or "song" zither, or for the so-called "concert" zither, while the "Schlacht," "Horn," or "Prim" zither—which is the most serviceable one for general use—is infinitely more graceful, as well as offering greater resistance to the stress of the strings, which, it need scarcely be said, is very great.

Fig. 1 gives the "Élégie" zither, which will be found to coincide with the one given on page 392; while in Fig. 2 I give the alternative shape—that of the "first," or solo zither. Now, there are probably many persons who already possess a zither; it may be without strings, and as there are comparatively few persons capable of stringing such an instrument, my remarks will, perhaps, be of service, especially as I have played the zither in all its forms ever since its first introduction into this country, many years ago, while as a teacher my success has been exceptionally great, for reasons which will be seen anon. Whether for a zither *in esse* or *in posse*—whether it already exists, or still has to be made—I will guarantee that, if my instructions are followed, there will not only be no mistake, but that the tone (always supposing you have got a sound instrument—one not cracked) will be much in advance of any tuned or strung otherwise.

Firstly, I should premise that there are two methods of stringing in vogue, viz., the Stuttgart and the Vienna methods. Fig. 3 represents the finger-board, or rather the open notes of the melody strings (those five

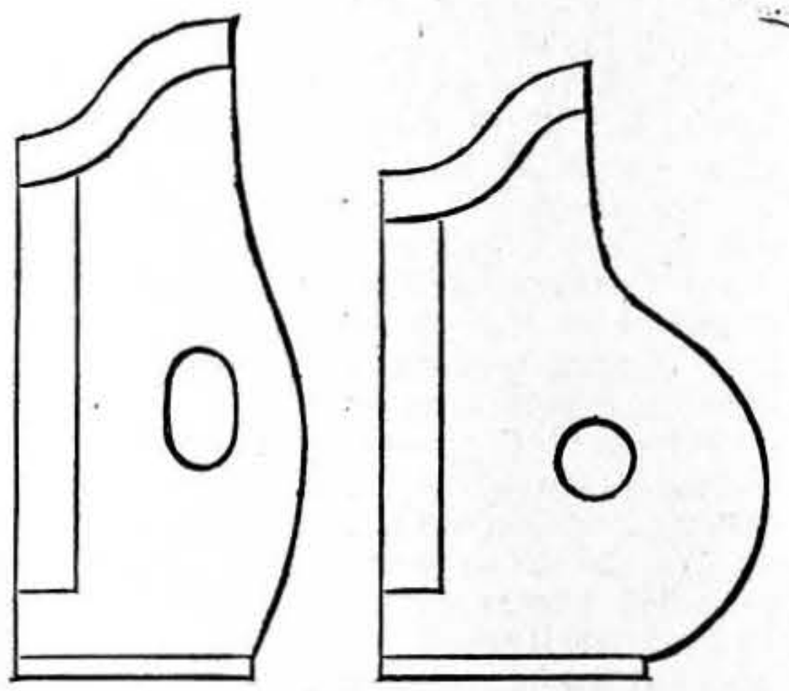

Fig. 1. Fig. 2.

Fig. 1.—The "Élégie," or Song Zither, used as an Accompaniment. Fig. 2.—The "Horn," "Schlacht," or "Prim" Zither; the Solo Instrument, and the only one useful for Characteristic Zither Music.

on the finger-board), of a zither strung on the former system, while Fig. 4 gives the Vienna method, which is the one most universal. And let me also add a word of encouragement to such as may possibly be deterred by the difficult look of the zither, with its numerous strings. I am aware that many so-called "instruction books" start off with, "The zither is a most difficult instrument, but," etc. Believe them not, they are fooling thee, as I, perhaps, should if you were going to give me a guinea per lesson, which is no uncommon fee for tuition on this most simple of instruments. I have myself received 5s. per hour for teaching it, but have always impressed the above fact upon my pupils. And the best proof that I am right lies in the fact that in the Tyrol, which is the home of the zither, it is played by "all hands"—men, women, and children. Again, anyone of ordinary intelligence may learn it in a week, although proficiency will only be attained by persistent practice. All there is to be learnt—that is, the methods of fingering with each hand, and the position of one major chord (which is all that there is to learn, as all others are exactly the same relative distance apart, and may be found mechanically)—may be written in the space of one sheet of WORK. Therefore, be ye not dismayed, but persevere, and you may play pleasingly and correctly in a month; if you want to do fireworks and other feats you will have to practice long and often, but that is not zither playing proper. The great sympathetic charm of the instrument lies in its capacity for conveying feeling, which must first exist in the soul of the player. For my own part, I do not profess to be a great performer, but I can have a room full of people in tears in no time. That is how the zither should be played. Before going on to describe the best method of stringing, I may say that, should anyone be desirous of trying my simple method of learning, I may be communicated with through the "Shop" pages, although I no longer teach professionally. And here a caution to such as buy their zither. When you get it, it will probably be useless, having, in nine cases out of ten, been strung with silk and gut strings, which are not only worthless as to tone, but which will keep you fully employed in trying to tune your instrument—one of the most hopeless of operations when such strings are used. Take it as an axiom, then, silk and gut strings are, for the zither, worse than useless. On the other hand, I have had instruments in daily use for weeks together without requiring more than a casual or occasional touch—certainly they have never wanted tuning throughout. Procure good metallic strings, which are to be had in sets, in boxes. Beware of the music-seller who promises to "get them," or to "make them up," he is a fraud. Such sets of strings should not cost more than 8s. or 9s., at the outside, although a well-known maker once charged me 17s. for a set. I am aware that they are not to be had except of such as import them direct from Germany, but, having got them, they will last you three years, unless your hands are very moist in their nature, when, of course, the strings gradually rust under the wrapping, and the tone suffers, not the string. I wish it were possible to contrast the tone of the silk and gut with the steel in the pages of WORK. What a convincing proof that would be! But string a fiddle with worsted, and you can guess the difference.

The sets mentioned do not, as a rule, include the steel and brass wire for the three first melody strings, but the fourth and fifth—that is G and C—both metal covered with metal, are included. Also, you may find in the set (each separate string having its number and note on a label) more strings than you have accommodation for. This is because a zither may have any number of strings, from twenty-two to thirty-two. Simply start at E flat (having first strung the finger-board), no matter whether numbered one or two. Some sets give G sharp as the first of the accompaniment strings. Don't use it if you find it so—you lose by it. As for any there may be over, simply discard them; they are not required for their legitimate place, but come in useful when you chance to break a string of similar calibre or gauge—an event which need never happen if care is taken to strain each string slowly and carefully, using frequent friction along its length in the process. Never string right up all at once, many strings "go" in this way. Make it a two days' job, and strain well before finally fetching up to pitch. Never go higher than half a tone lower on the piano, unless you wish to accompany another instrument, which zither players are, as a rule, not fond of, except in the case of such instruments as the guitar or mandolin, which can always be made to accord with the more delicate

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zither. Having procured your strings, including a reel of each, steel and brass, which are sold specially, and cost about 6d. per reel, cut off about three or four inches of steel wire more than the length of the instrument from tail-piece to pegs. Then, with suitable pliers or your fingers, form a very small loop at one end, the smaller the better. Pass this loop over the pin at the

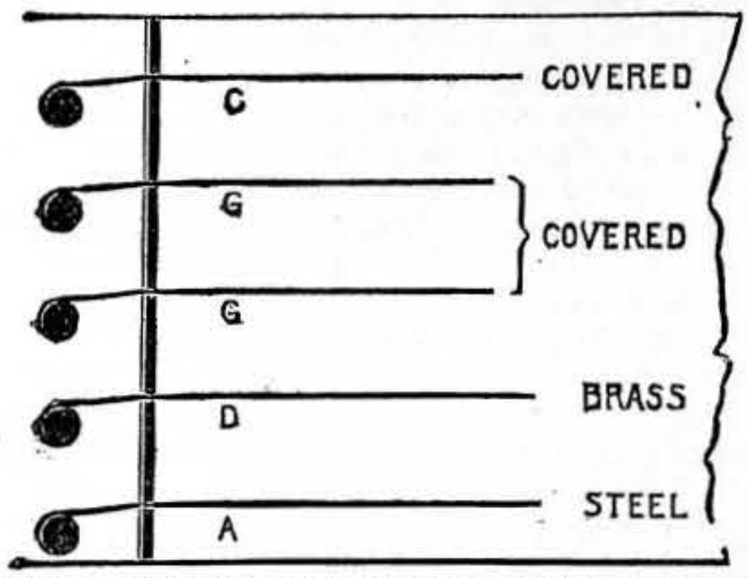

Fig. 3.—The Stuttgart Method, seldom used in England. The Strings bracketed are tuned alike.

tail-piece end and the string up through the groove in the latter. Then run the string through the finger and thumb of the right hand, so as to have it perfectly straight and free from "kinks." Insert not more than 1 in. through the peg-hole, and, with the tuning-key, wind the string evenly on the peg, using the right elbow to keep the looped end from springing out of the groove, or off the pin, and the right hand to guide the string evenly on the peg. When the string just "bites," and there is no fear of its springing out of place, leave it and pass on to the next, taking care in each case to pass the top of the string behind the little pin behind the nut (see Fig. 1, page 392).

When you have got on the three wire strings, you will find all others already provided with proper loops, which only want looping on to the pins and through the groove, but take precautions against twisting and "kinking." Also be very careful in unwrapping each string, as any actual bend in a string would probably result in a break.

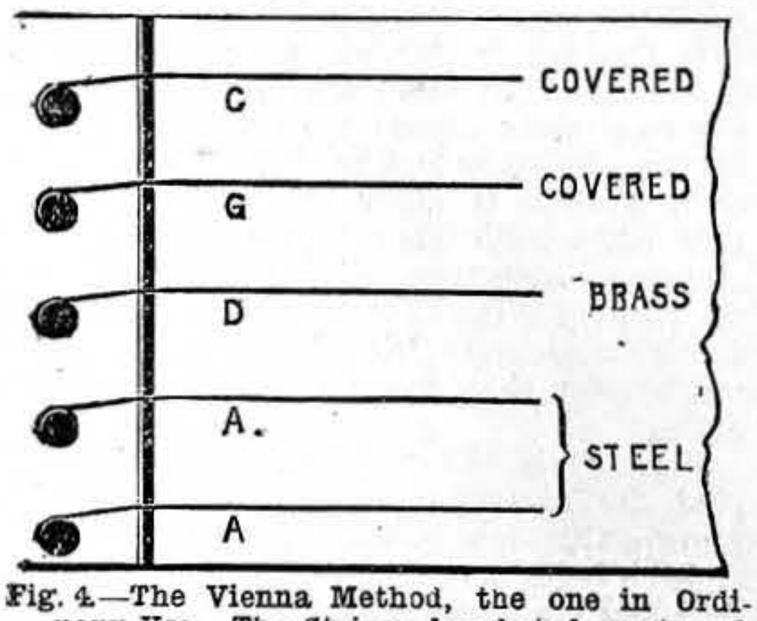

Fig. 4.—The Vienna Method, the one in Ordinary Use. The Strings bracketed are tuned alike.

Having got all the strings on, proceed to raise them carefully, beginning at the first. Fetch that one up to about E (under the stave) by the aid of a pianoforte or tuning-fork. Similarly with the next, which also has, eventually, to come up to A. Fetch the brass wire string up to about B, and so on, straining carefully each string. Now leave to stretch all night, after which proceed to tune the second string to A, then the first to it. Then place the forefinger of the left hand behind the fifth fret (where the first spot is) and tune the brass string to it, but an octave lower. Then stop the D string on the fifth fret, and tune the G to it, and the same with the next, which is C. Then your finger-board is complete, and in tune. Now comes the turn of the accompaniment strings, which comprise the first twelve after those on the finger-board. Tune these according to the following diagram :—

Number of String.	*Name of Note.*	*How to form it, to tune to.*
1	D sharp	On the first fret of the D string.
2	B flat	„ third „ G „
3	F	„ „ „ D „
4	C	„ fifth „ G „
5	G	„ „ „ D „
6	D	By the open D string.
7	A	On the second fret of the G string.
8	E	„ „ „ D „
9	B	„ fourth „ G „
10	F sharp	„ „ „ D „
11	C sharp	„ sixth „ G „
12	G sharp	„ „ „ D „

Now all the work is done, as the thirteenth string is tuned an octave lower than the first, the fourteenth than the second, and so on throughout. Some strings in the bass, which begins at the thirteenth, are usually tuned two octaves lower—such are C and D sometimes—but you will easily recognise these by their greater thickness, and the utter impossibility of getting them up another octave. Don't try. Thus far the tuning. As to the proper position of the hands, etc., in playing, I should be very glad to write another article on that, but I am afraid the Editor has had enough zither MS. By the method I have given anyone may easily string up a zither, and do it properly, too, while, by attending to the hints I have given respecting choice of strings, etc., you can ensure having your instrument as nearly perfection as a very perfect instrument like the zither is capable of.

SHORT LESSONS IN WOOD-WORKING FOR AMATEURS.

BY B. A. BAXTER.

The Plane.

A FEW lessons in wood-working being desired by some readers, I will, without further preface, begin.

The use of the plane should be attempted before any other tools are studied. If the beginner buys a new jack-plane, and he can get the tool merchant to sharpen and set it while the buyer waits and watches, let him do so; but if so valuable a lesson cannot be had, try to sharpen it as follows :—

Knock out the iron. This may be done by grasping the plane, turned upside down, with the right hand, while the left holds the wedge and plane-iron. A gentle blow on the bench should leave the iron and wedge in the beginner's left hand. Do not drop them, which you will do if you hold them carelessly. The cutting-iron is now to be separated from the cap-iron by loosening the screw with a screwdriver. The safe way of doing this is to hold the iron on the edge of the bench, the screw just off, but close to, the bench edge. To sharpen the plane, rub firmly but gently on a clean oil-stone on which is a little oil. (For a lesson on Sharpening, see WORK, Vol. I., page 310.) Be careful to put the plane together as the maker intended; beginners do not always do so.

It is important to learn to set the plane by the eye, so that without trying the plane and going through that unsatisfactory process of tapping and withdrawing the iron, you become able to place the iron so that it will take off a shaving proportionate to the hardness of the wood and the strength of the operator. I should advise the beginner not to attempt to use a plane the iron of which projects more than the thickness of the paper on which this is printed. He can afterwards remove stouter shavings, but some considerable experience in teaching prompts me to lay stress on this matter.

Another little point on which a warning is necessary : in placing the cap-iron and the cutting-iron together, do not let their edges pass each other, or the newly sharpened edge will suffer. Sometimes in screwing together this will happen; if so, it is usually because the head of the screw touches one side of the iron before the other. As the screw is generally accurately turned, the fault may be in the boring of the brass nut which is fixed to the cap-iron, or it may be in the cutter-slot being thicker at one edge than the other, or some roughness in the slot, or the whole cutter or cap-iron may be bent or winding. Whatever the cause, find it out, cure it, or change the iron, for there is nothing more trying to a beginner than having with care sharpened the plane-iron, and find, to his annoyance, that in the screwing together of the two irons the cap-iron passes the sharpened edge and spoils it.

KNOTTING, SPLICING, AND WORKING CORDAGE.

BY LANCELOT L. HASLOPE.

Some more Fancy Knots.

SINGLE PITCHER KNOT—PITCHER HANDLED—DOUBLE PITCHER KNOT—SLINGING A CAN—SHAMROCK KNOT—DALLIANCE KNOT—DAVENPORT BROTHERS' KNOT—BELL-RINGER'S KNOT.

FIG. 98 is the "Single Pitcher" knot, known also as "Tom Fool's" knot. The easiest way to make it is to form two half hitches, as shown in Fig. 99, one lying half-way over the other. With the finger and thumb of the left hand draw the part A down through the bight, and with the same fingers of the right hand bring the strand, B, upwards through the bight, under which it lies. Pull the loops thus formed out to a sufficient length and knot the ends together. When used to supply the place of a broken pitcher handle, the centre knot should be hauled taut, and the pitcher being placed on it, the loops are brought up to form handles. To keep them in their places a lashing is put round the neck of the pitcher, as shown in Fig. 100. This knot is also very useful in slinging a shot when required as a weight, or for any other purpose. In this case the centre knot is not hauled taut but left open, forming a large loop on which the shot lies. If the ends are spliced instead of knotted a three-loop knot is made. It is also used as a trick knot to puzzle landsmen, and from this arose its name of "Tom Fool's" knot. To make it in this way, turn the left hand with the palm upwards and lay one end of the cord across it, holding it against the side of the hand with the thumb. Turn the right hand over so that the backs of the fingers are downwards and the ends of the fingers pointing towards you; take up the other end of the cord on these fingers, but do not close the hand; bring the right hand, without altering its position, over the left, until the part hanging down over the first finger of the right hand hangs outside the left hand. With the third and little

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fingers of the left hand seize the cord which hangs down over the little finger of the right hand, and at the same time with the right thumb and the other fingers of the same hand take hold of the cord which is on the left hand. If the hands are now separated the knot will form.

This is a good puzzle, as from one hand lying over the other as the knot is made, it is impossible to see that one end is grasped between the third and little finger of the left hand, even when the knot is made slowly and with every apparent intention of showing how it is done.

Fig. 101 is the "Double Pitcher" knot.—This also goes by the names of "Jury" knot and "True Lovers'" knot. It is used as the single pitcher knot to sling a broken pitcher, but in this case we have four loops to carry it by instead of two. In rigging a jury-mast the end of it is put through the centre of the knot before it is hauled taut; the stays to support and steady the mast are then made fast to the bights of the knot. It is called, I believe, a true lovers' knot because there is no end to it. Form two half hitches in a piece of cord, as in Fig. 102, then make another hitch, which draw behind the other hitches with the inner edge overlapping the inner edge of the first hitch, as shown in Fig. 102. Pass the forefinger and thumb of the left hand over strand A under B and take hold of C. Put the same fingers of the right hand under D over E and take hold of F. Take G between the teeth and draw the three loops out. It is better to make G the length required at first, as the other loops being immediately connected with the ends can be more readily adjusted as to size than the upper loop. When the loops are made the right size the loose ends are spliced together with a short splice, thus forming the fourth loop. The knot is now completed.

Fig. 103 is a ready way of slinging a can which comes in useful for a variety of purposes, such as turning a meat can into a paint pot, dipping for water, etc. etc. Pass the end of the cord under the bottom of the can and bring the two parts over it, and make with them an overhand knot; open the knot, as shown in Fig. 104, and draw the two parts down until they come round the upper edge of the can; haul taut, and knot them together again over the can, as shown in Fig. 103. This is a very useful dodge.

Fig. 105 shows an ornamental knot that was discovered by a correspondent of the *Queen* newspaper hanging below a Japanese lamp. It has been named the "Shamrock" knot. Of course the ends could be spliced, thus forming a four-looped knot if required. Whether it is ever used in Japan otherwise than for ornamental purposes I cannot say, though it is evident that it is available for the same uses as Fig. 101. It is not, however, as good a knot as the other, being more troublesome to make and not so strong, in consequence of the short nip of the strands in the centre of the knot. Fig. 106 shows the way of making it. An overhand knot is first formed with the ends at A; the end B is then laid across the upper loop, brought round and under the right loop and up through the bight C. The strand D, after passing at the back of the upper loop, is carried over the left loop and down through the bight E. The loops are now adjusted for size and the knot hauled taut. Fig. 107 gives another way of making this knot. Two overhand knots intersecting one another are made on the ends, as shown in the figure; the part A is then drawn up through the bight C, and the part B down through the bight D. These form the side loops, and the top loop being pulled out, the knot is completed. By an extension of these methods knots may be made with any number of loops, but the difficulty increases greatly as the loops increase, so much so, that many loops cannot be made without wire is used instead of cord. As this would lead us beyond the scope of these articles, I shall leave the matter to my readers to follow out by themselves, if they deem it worth their while.

Dalliance Knot.—This is a trick knot, and rather a difficult one to learn when you merely see it rapidly made. The object is to make two double knots, quite independent of one another, at once on a double cord. Double the cord so that the ends lie together; bring the bight over the standing parts, as shown in Fig. 108, and cross the strand A over the strand B; they will now appear as in Fig. 109. Press the part C down between the two strands on which it lies, and bring it up through the opening D, draw it out, and two overhand knots will be formed on the double cord. While the part C is being drawn out through D, the whole of the loop E must be brought up through the bight F; this forms the upper knot. The lower knot is made by loop F, C forming bight at top of double cord. The finished knot is practically the same as Fig. 16 (page 137).

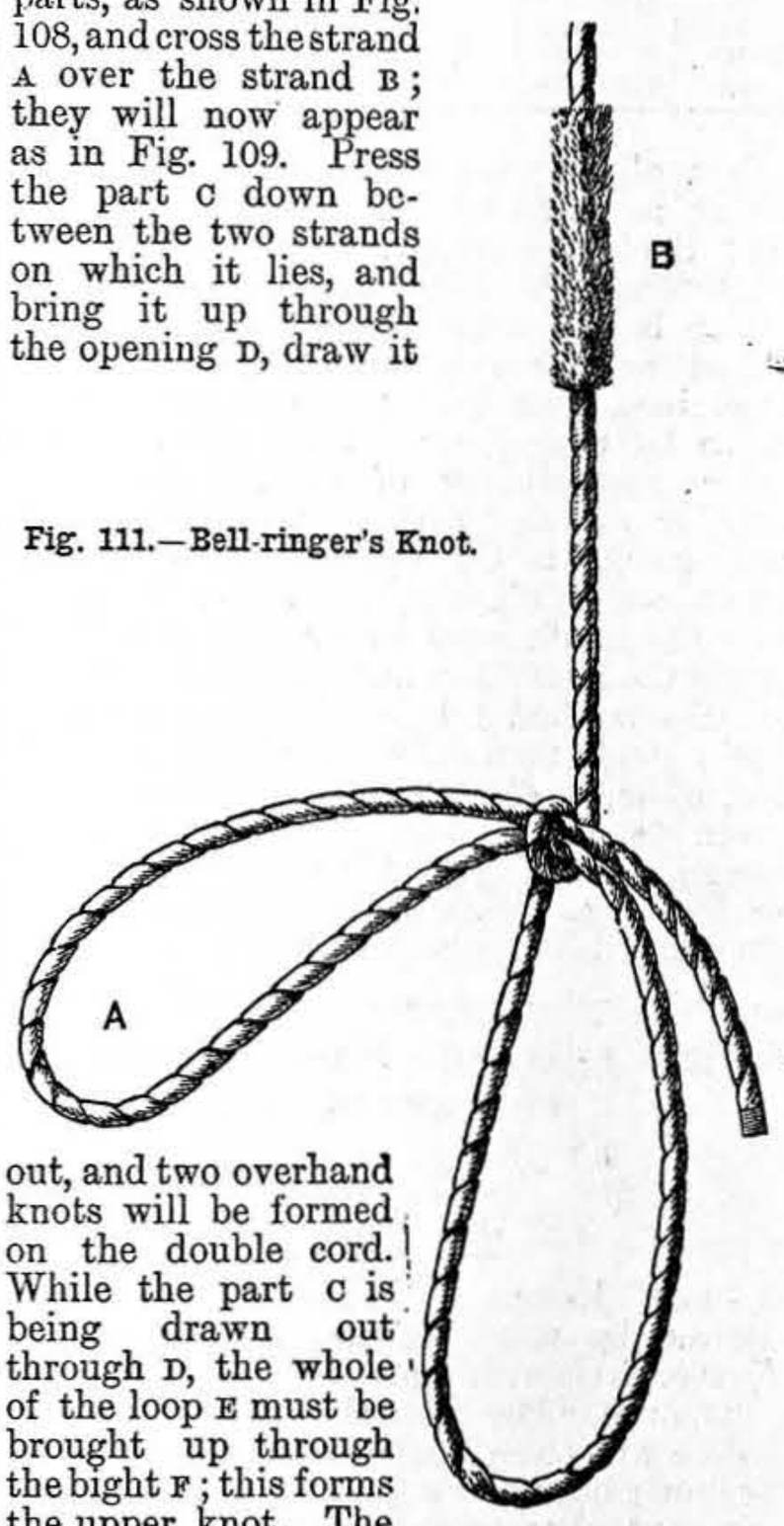

Fig. 111.—Bell-ringer's Knot.

Some of my readers will doubtless remember the performances of the so-called Davenport Brothers some years ago. These consisted of various tricks performed with ropes. In the principal one the performers were shut up in a cabinet, and when the doors were thrown open they were found seated on two chairs tightly bound hand and foot. Any amount of examination of the ropes and knots was allowed. The moment after the doors were closed they rang bells, played on the tambourine, and threw things out of a small window in the top of the cabinet. On the doors being opened again directly they were found firmly tied to their chairs as before. They claimed to effect this by spiritual agency, whereas their only assistant was an ingeniously contrived knot, which is shown in Fig. 110.

To perform the trick, two ropes about 12 ft. long each are required; they should not be too stout—the kind used for cording boxes is as good as any. First the knot A joining the two ropes must be made. This is an openhand knot, shown in Fig. 8 (page 65), the ends being passed twice through the bight to increase the size of the knot. Two running knots are now made close up to this knot as shown at B, B. The knotted end of the ropes is laid on the seat of a chair with the ropes passing down the back of the seat and under the chair. The performer seats himself on the chair, and, drawing the loose ends of the ropes up in front from under it, he passes them round and round his legs and the legs of the chair in as complicated a manner as he can devise. He now draws the knotted end from under him, and, putting his arms over the back of the chair, passes his left hand *down* through one loop and his right hand *up* through the other. He now turns his right hand down until the palms of both hands are together and the fingers pointing downwards. This produces a twist in the ropes which takes up the slack and tightens the cord round the wrists. The large knot being between the hands effectually hides this, and the wrists merely appear to be as tightly bound together as they can be. The performer has merely to reverse this last proceeding—that is, to bring the right hand up again, and so undo the twist—and his hand can be withdrawn as readily as it was put into the loop. The trick requires some practice, and the size of the loops must be regulated by the size of the performer's wrists. The knots should also be so placed on the chair at the commencement that the ropes are tight when the hands are in the loops. Of course, they can be tightened by the performer leaning forward, but it looks better and puzzles the audience more if the actor is so bound that he cannot move in any direction. The Davenport Brothers used also to perform the ordinary rope trick, which consists of the performer being bound by any of the audience; he is then covered up, and when, in a few moments, he is uncovered again, he is found to have freed himself from the cords with which he was tied. This is done by expanding the chest and making the muscles as rigid as possible whilst the tying is going on. When the muscles are relaxed there is not much trouble in slipping off the rope, particularly if it is a new one. The Davenport Brothers were checkmated in this trick by some Liverpool gentlemen securing their hands with a Tom Fool's knot, and also on another occasion by tying their thumbs together behind their backs with whipcord. There is no better way of securing a man than putting his hands into the loops of a Tom Fool's knot and knotting the ends securely behind his back. It is much safer than using the ordinary handcuffs.

Fig. 111 is the "Bell-ringer's" knot.—I give the name by which it is commonly known, although it is a hitch and not a knot. Church bells have a large wheel on the axle on which they are hung, round which the bell-rope passes; this is done to obtain sufficient leverage to raise the bell mouth upwards when it is rung. This requires a long rope, a good portion of which lies on the belfry floor when the bell is down. When the ringing is over this slack is always hitched up out of the way in the manner I have shown. A loop, A, is made near the end of the rope; this is laid against the standing part, and a hitch taken over it at about the height of a man's head. The hitch should be kept quite close to the standing part, and it will hold the loop quite securely; at

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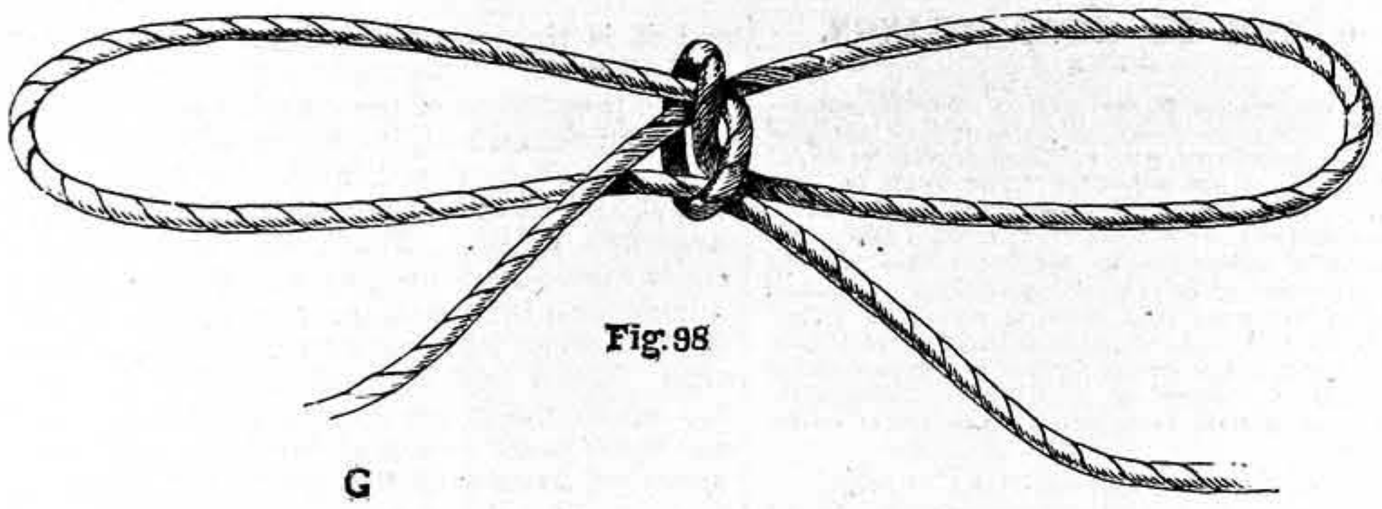

Fig. 98

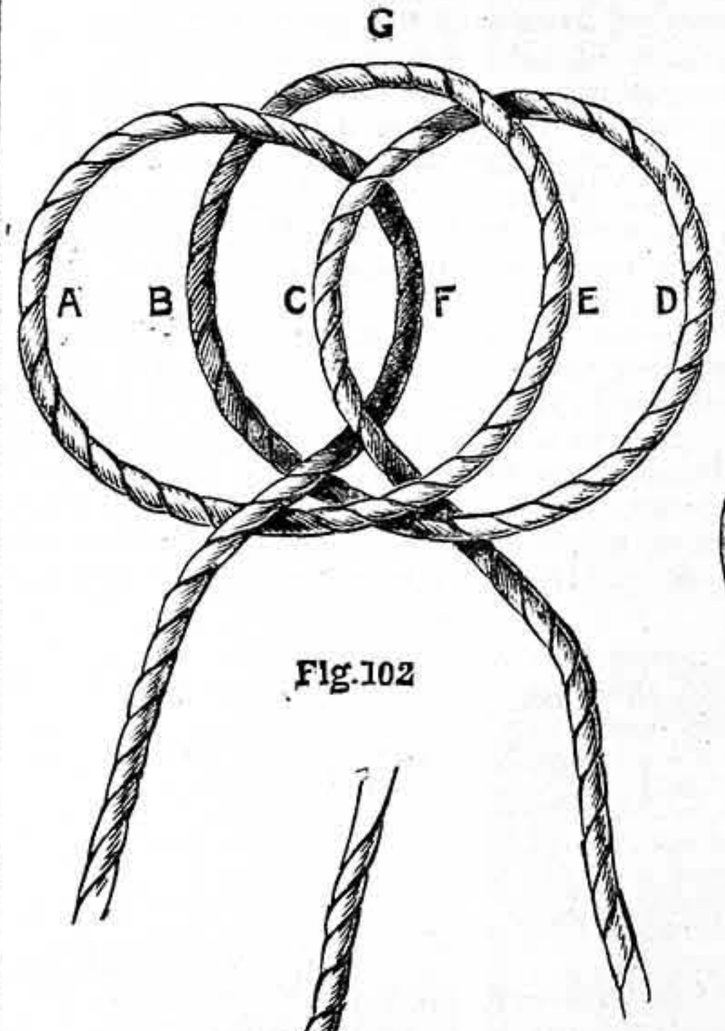

Fig. 102

Fig. 100

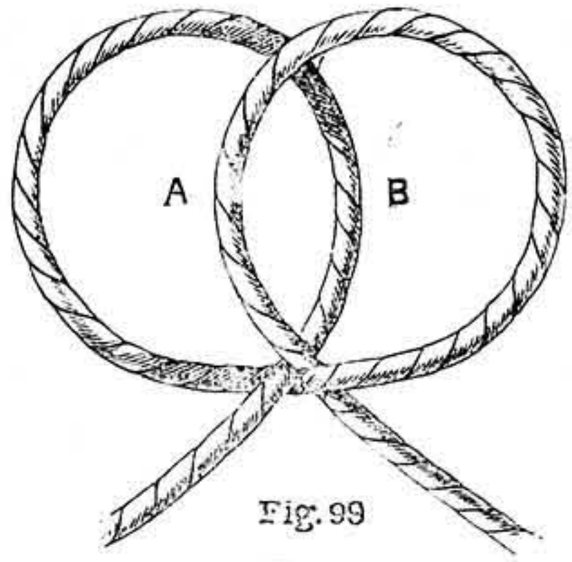

Fig. 99

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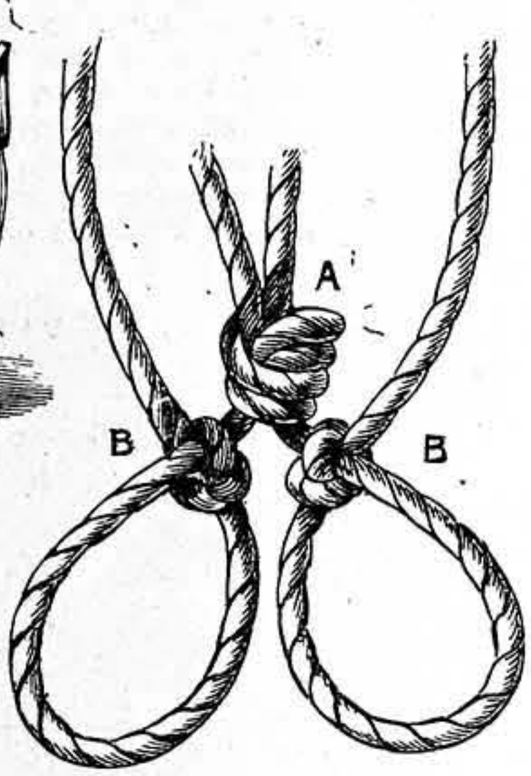

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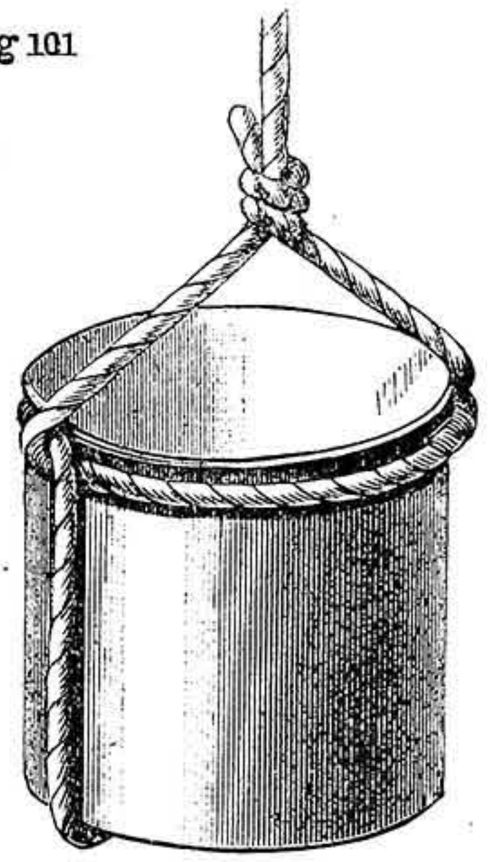


Fig. 103.

Fig. 104.

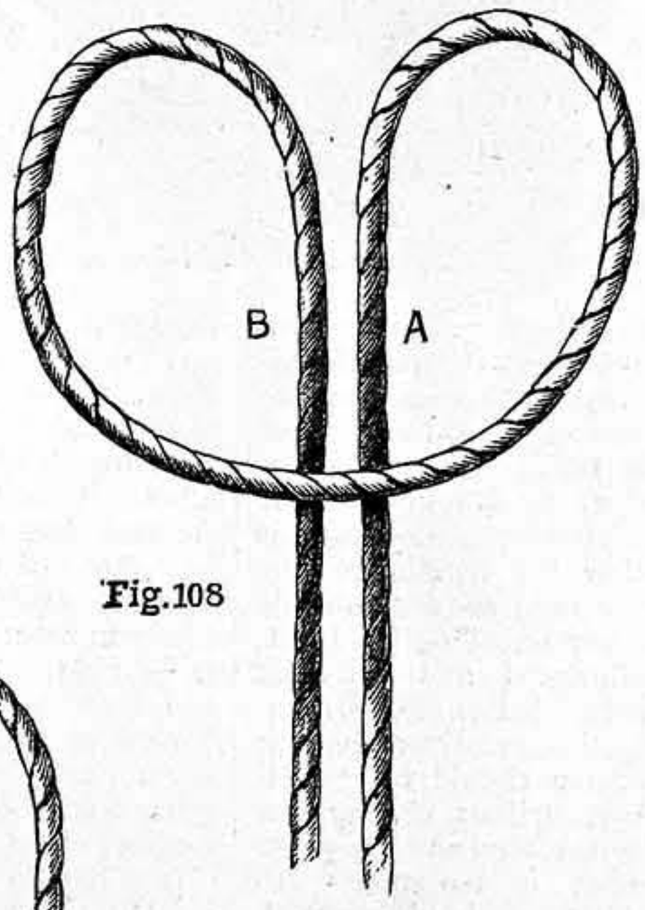


Fig. 108

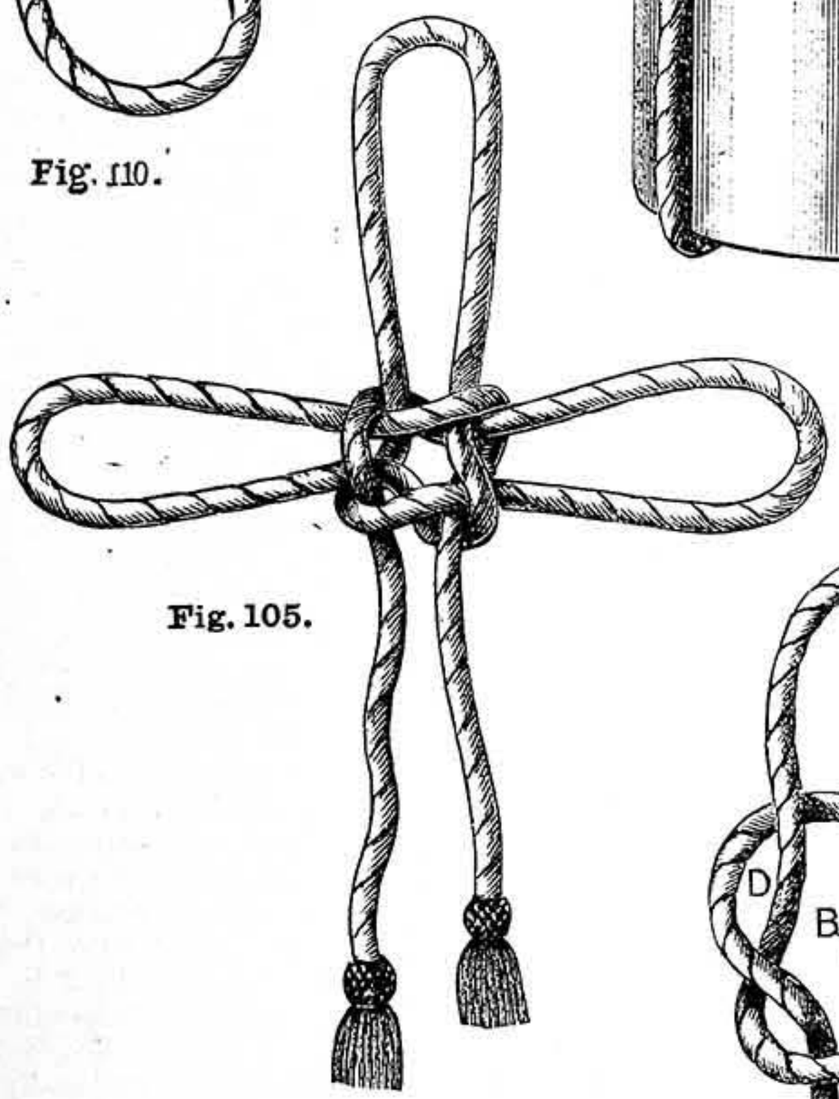
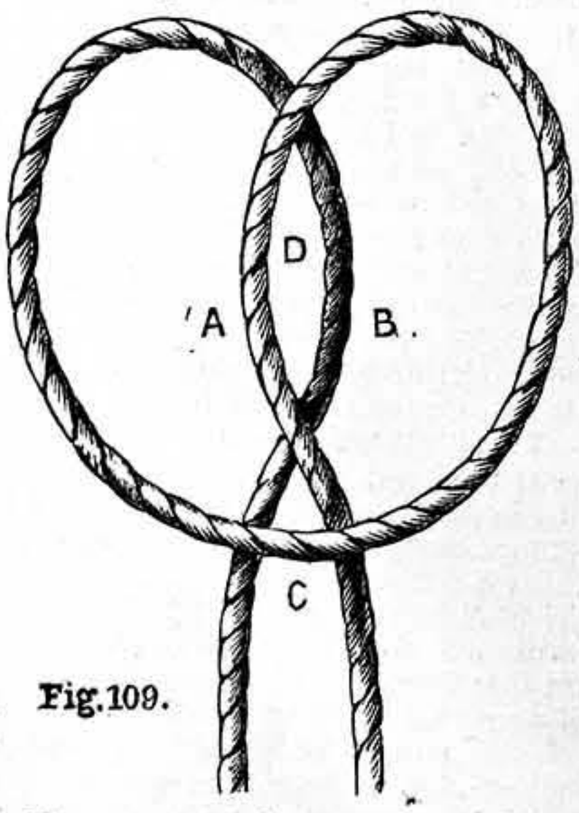


Fig. 105.



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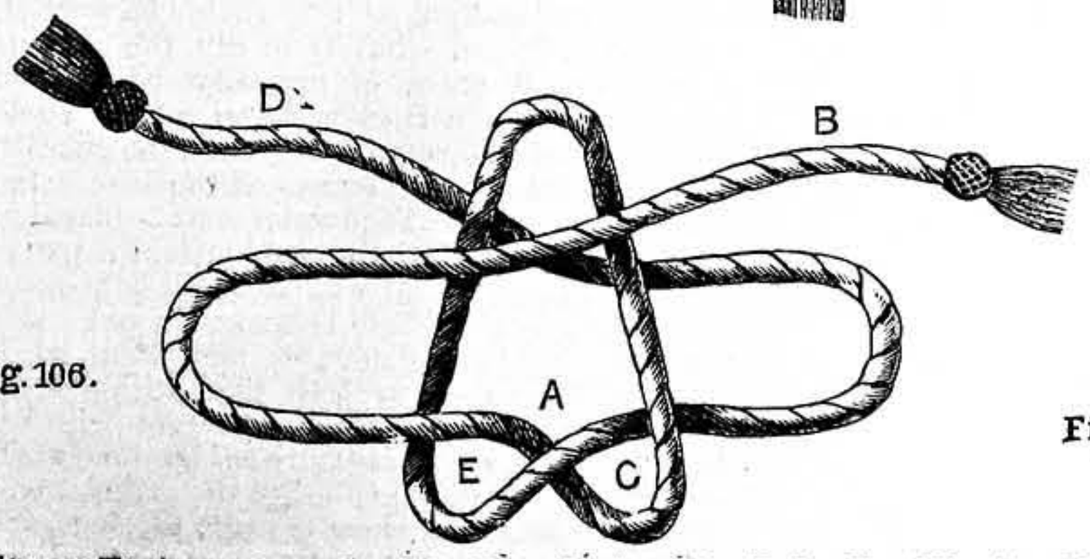

Fig. 106.

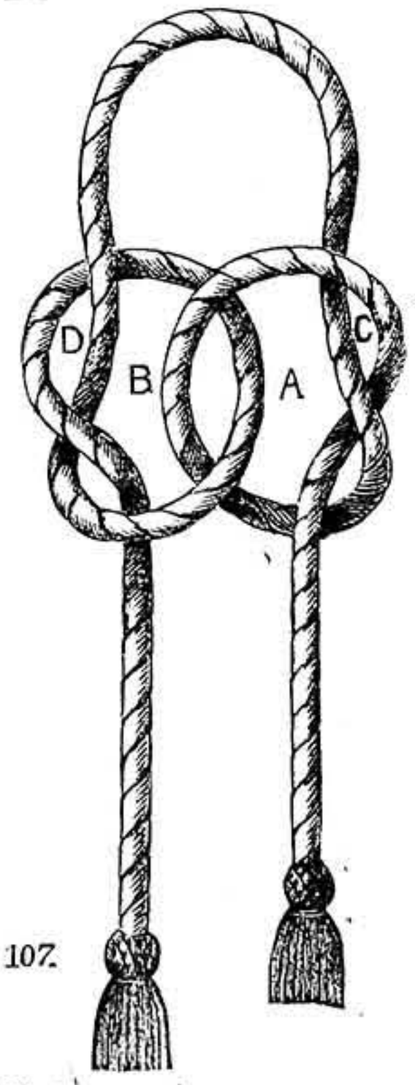

Fig. 107.

Fig. 98.—Single Pitcher Knot. Fig. 99.—Single Pitcner Knot commenced. Fig. 100.—Pitcher Handled. Fig. 101.—Double Pitcher Knot. Fig. 102.—Double Pitcher Knot commenced. Fig. 103.—Slinging a Can. Fig. 104.—Ditto commenced. Fig. 105.—Shamrock Knot. Figs. 106, 107.—Shamrock Knot commenced. Fig. 108.—Dalliance Knot. Fig. 109.—Dalliance Knot commenced. Fig. 110.—Davenport Brothers' Knot.

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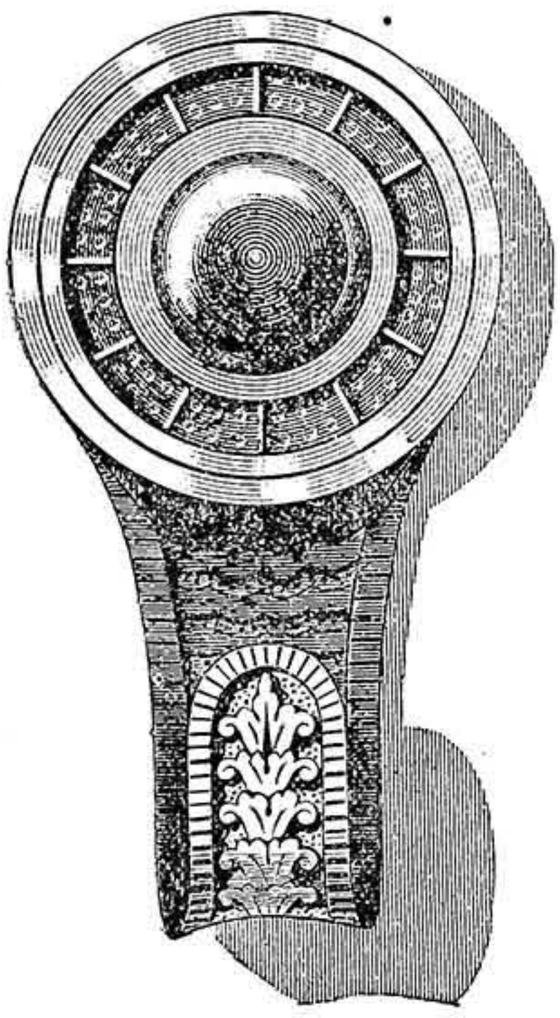
the same time a slight pull at the end releases the whole thing at once. When I was an amateur bell-ringer anyone leaving their bell-rope trailing about was subject to a fine. The part B where the rope is grasped when the bell is checked as it comes over is called the sally or tufting. It is made by opening the strands and inserting short pieces of worsted, which are afterwards trimmed until they are all of one length.

A PICTURE SUSPENDER.

BY JAMES SCOTT.

It is as well, when hanging must take place, that it should be accomplished with adjuncts not too revolting; therefore, when a picture is about to be hung, the use of the most befitting attachments should be undertaken. A disreputable-looking nail protruding from a wall whereon is suspended a tolerably well-executed picture is a common



A Picture Suspender.

sight to behold in many households. Sometimes the nail may have a brass head, which fact in itself is sufficient to speak for the opinion which is generally held of a bare nail. Someone, however, has flown higher still in his estimation of what is necessary to support a picture. The outcome of his cogitations is represented in the illustration. The article is made of brass. The circular face consists of a removable embossed cap, which fits closely outside a rim which is raised around the upper circular portion of the hook. A hole is pierced in the upper circular portion of the hook to receive a nail which is to pass through it into the wall. Over the hook travels the supporting cord. Thus it will be seen that the nail, although unsightly, is yet indispensable. So it always is—the weakest to the wall. But it must not be forgotten that in this case the nail is weakest in aspect only.

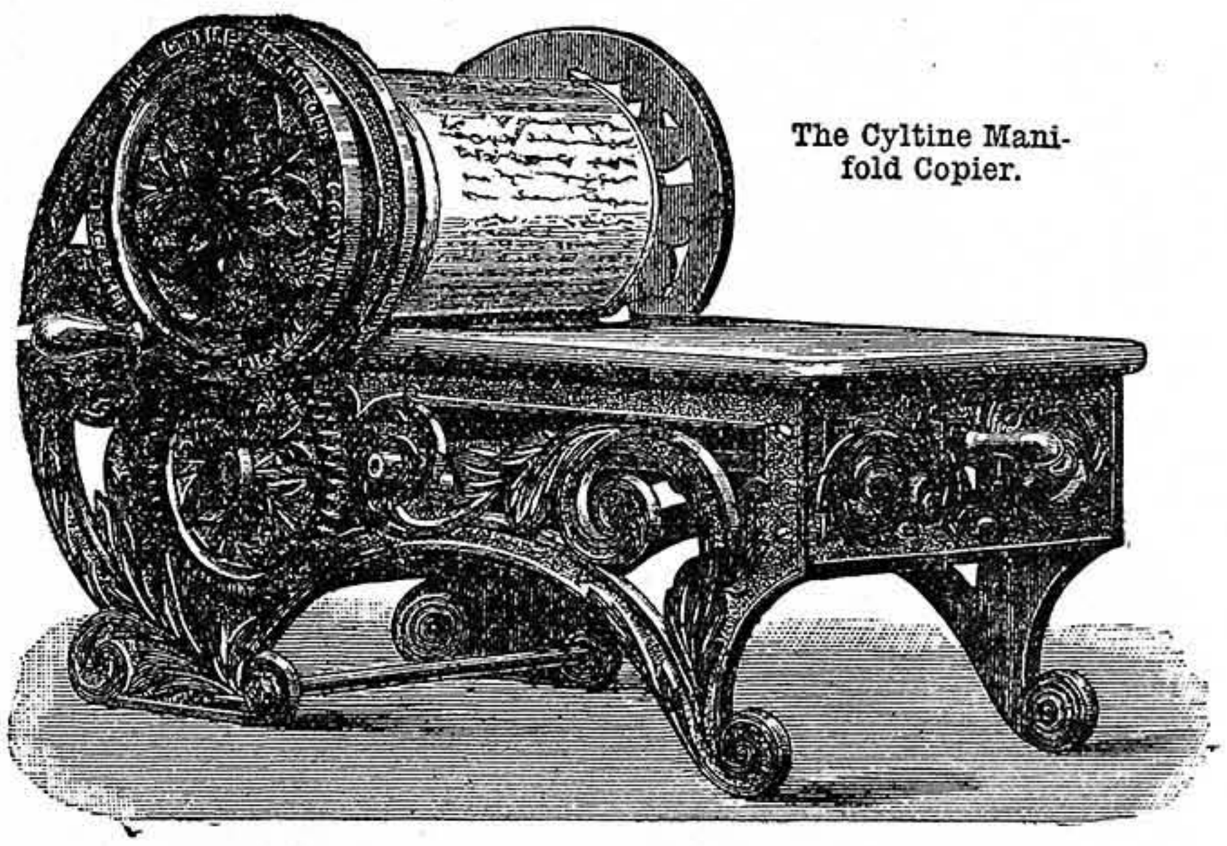
It may be pointed out that this picture suspender is merely an adaptation of the hook that is used for hanging pictures on a brass bar generally fixed a few inches below the cornice to the purpose of hanging a single picture. Its use is entirely a matter of taste and preference.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

85.—The Cyltine Manifold Copier.

In the accompanying illustration will be found an excellent representation of a new lithographic copying machine for office use, well adapted for the reproduction of circulars, plans, notices, blank forms, shorthand, music, bills of fare, menus, quantities, instructions of special character, and, in short, for doing anything and everything in the shape of office manifold copying. It has been brought out by the Cyltine Manifold Copying Machine Company. As I have not seen a specimen machine, I can say nothing definite with respect to its working, but to judge from the specimens of work done by its aid which have been submitted to me, it appears to be a useful and effective appliance for office work, and one which all readers of Work requiring such a machine would do well to inspect before making a final selection from the copying appliances already in the market.



The Cyltine Manifold Copier.

The Company claim for their copier the following advantages in addition to cheapness of reproduction after first cost: Originals are written with an ordinary pen with a free-flowing special ink, and can be copied without delay. Unlike the ordinary apparatus, made of wood principally, which may be moved from place to place, and, from its mobility, is liable to injury resulting from falls or other accidents, the Cyltine Manifold Copier is a permanent institution like the screw press for letter copying. It is the cleanest working copier, and the result, in jet black or any other colour, is equal to lithography. It will print to register on ruled paper. There is no hand rolling: turning the handle of the machine does the work. Sheets are fed into the machine from the mahogany board on the front, and are automatically printed and delivered straight as they go in, not curled or creased.

In order to use the machine to advantage, it is necessary that the operator should be "neat-handed"—that is to say, neither clumsy nor awkward in handling the machine and the paper on which the impression is received. All machines are sent out as they should be worked, with one exception—that is to say, the gelatine is dry, and it must, of necessity, be damped before the machine is in working order. To do this, the plated clips must be put on the gelatine before soaking, in the centre, and the dogs in the centre of the clips. Then water must be placed in the tray, and the gelatine scooped under the water, which has the effect of excluding all bubbles of air. The gelatine should be soaked in and under the water for twenty minutes, and when taken out should be wiped on both sides with a damp chamois leather. No other detergent will do. As soon as the surplus moisture has been removed, the gelatine has to be applied to the cylinder and secured by passing a screw through the dogs, the screw being tightened with a key supplied for this purpose. When the wrinkles in the gelatine have been smoothed out with the damp leather, and it is tight on the cylinder, the machine is ready for use.

The preparation of the copy is simple enough: as already explained, it must be written with the ink supplied by the Company for this purpose, and should be written on fairly thick paper with a smooth surface. When the ink is dry, the paper should be damped on the back and laid in a book for a minute to prevent it from creasing when it comes into contact with the damp gelatine. When applied to the gelatine, it must be fed up to the gripper stops, and when nipped, the paper must be folded over the gelatine and smoothed down with the right hand, so that the surfaces of both gelatine and paper may be brought into contact in every part. They should be kept in touch from half a minute to two minutes, according to the number of copies required. When the "copy" is taken off, the cylinder must be washed with wetted leather, which must then be squeezed out and again applied, to dry off.

The work of printing may now be started, but as when the gelatine was put on the machine and the copy placed on the gelatine, the ink rollers were disconnected by taking the springs off and drawing the brass roller back into the recesses, which had the effect of causing the compo roller to drop out of touch with the cylinder. Ink must now be applied from the tube that contains it here and there to the pad, and rolled up evenly with the loose brass roller. The pressure of the cylinder is regulated by the screw under the screw-board, but too much pressure should be avoided, and the nut locked after altering the screw. An easy, steady rotation does the best printing, and care should be taken to work the machine regularly and without exerting too much force, as this is likely to injure the stop against which the latch is brought. When the latch is at the stop is the time to feed the paper into the gripper. This done, press the latch to start, and make a clean circle back to the stop, then feed in another sheet, and so proceed until the requisite number of copies have been worked off.

The handle shown in front of the machine is used for throwing the cylinders out of touch when working up the ink on to the negative. In the ordinary way, the loose brass roller carries ink sufficient for from thirty to fifty copies; but when the work is large, more frequent inking will be required. When the machine is working, the brass roller at the back, carrying the ink supply, should stand in the recesses, and should only be lifted out and brought into contact with the compo roller when more ink is required. It must be borne in mind that when the cylinders are in touch a revolution should not be made without putting in paper to receive the impression, or the bottom cylinder will be printed. From the description of the manner of working which has been given, and the illustration of the machine, some idea may be gathered of its utility for the various purposes mentioned in detail above.

The Editor.

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SHOP:

A Corner for Those who Want to Talk It.

*** *In consequence of the great pressure upon the "Shop" columns of* Work, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of Work *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

II.—Questions Answered by Editor and Staff.

Paint (for Art Ironwork).—T. H. (*London, S.E.*), Amateur, and Others.—I believe the black known and sold in the trade as "Berlin black" would be the article you require for coating art metal work. Mander Bros., Wolverhampton, and most other manufacturers, make this: but only a few put it up in small quantities. Recipes for making flat blacks are given in Vol. I., and a little gloss could be given to them by adding a little more of the varnish or binding vehicle.—F. P.

Water Gold-size.—S. H. (*Elmore*).—On p. 603, No. 38, Vol. I., you will find a useful *résumé* of the "water-gilding" process, and which, in justice to inquirers generally, I must refer you to. I should think, however, that you would more easily succeed in re-gilding the frame in question by stopping the cracks with either "white-lead putty" or distemper "filling-up," according to the nature and appearance of frame and cracks, then paint with sharp colour and size, and gild in *oil gold-size*. This, if done well, would have a good burnish, and last longer than water gilding, as the latter cannot be so easily washed or cleaned up. The oil-gilding method has been repeatedly explained briefly, but sufficiently for you, in Vol. I., which I hope, like all sensible readers, you have bound up and ready at hand to refer to. J. Hill, of Pentonville, will supply gold-size, oil or water.—F. P.

Blackthorn Varnish.—M. C. (*Crossgar*).—Although unable to bring the experience of a specialist in "blackthorns" to bear upon your inquiry, I conclude it ought to be a good "*hard*-drying" varnish for coating them with. *Patent knotting*, or knotting composition—which is a quick-drying varnish—is used to a considerable extent for cheap umbrella handles and sticks, and it answers the purpose very well, drying hard in about half an hour. It can be made by taking the subjoined ingredients, placing them in a vessel, and dissolving with gentle heat:—1 quart vegetable naphtha, ¼ lb. oxide of lead (red lead), ¼ pint japanner's gold-size, and about, but not more than, 1 lb. of orange shellac. Stir and well shake until quite dissolved, then strain through fine muslin. I think this should suit you, and would also do for the "barkless parts" if you spread it carefully with a camel-hair polisher's brush. Sorry I can't advise *re* the "burrs." I fancy if such are subjected to steam, they may become pliable, and can then be bent to shape desired, but have no personal experience to advise on this point. Our worthy Editor will doubtless appreciate the "model sword-thorn"—although I do not think he has so far found it necessary to keep a "fighting editor," and notwithstanding "Shop" contains an occasional "warm corner." Thanks for "good wishes," and, of course, *recommendation*.—F. P. [No, there is no fighting editor kept, as the Editor can do all that is needful in that line in any way for himself.—Ed.]

Enamel, etc.—Ibex.—I would have preferred to know the purpose and article the enamel is required for before advising you, but hope this will be useful. Firing glass is a risky method unless it is thoroughly understood and prepared especially with that object in view. For "backing" a piece of plate-glass which has been lettered upon and requires a white ground, I should advise coating it *very barely* once or twice with quick hard-drying paint, made with white lead (preferably, tube flake white), and either bath varnish and turps in parts one to two of the liquids respectively, or Japan gold-size and turps. When fairly solid, this could be finished with a little flake or zinc white (tube pigment) in the best light copal varnish you are able to get, made for interior work if your object is indoors, or using *bath varnish* if it is outdoor work. If you spread a white oil enamel directly on *smooth* glass it would probably, in time, peel off; but by using the "sharp" colour we get a "grip" or "cement" between glass and enamel, and likewise get a better body and solidity than enamel alone will give. Ready-made spirit enamels will not do; they will crack and peel off very quickly. Write Waterlow & Sons, Limited, Finsbury Works, E.C., respecting the "perforator."—F. P.

Commode.—C. B. (*Notting Hill*).—When your letter was handed to me, I had a paper in course of preparation dealing with a combined commode and clothes-holder, which I had designed as something fresh. Such an article is rather a delicate subject to appear in the body of Work, where it would, doubtless, possess a certain amount of repugnance; therefore, I will take advantage of your query and endeavour to explain it satisfactorily in "Shop." Space is limited, so I must speak briefly. In Fig. 1 the dotted line suggests a place for a necessary article which shall be nameless. At each side is a bed-step—carpeted. Hooks can be fitted to each of the top boards to hold apparel at night, in preference to its being thrown on to chairs, etc. When closing the article (seen by Fig. 2) the front flap is raised, the box then pushed into the main carcase, the supports of the bedstep folded inwards underneath the latter (Fig. 4), and the whole raised up against the side of the carcase, where they will be secured by means described later on; the two top sideboards are then folded inwards, as shown by skeleton diagram, Fig. 5. From this explanation it should be understood how and where the requisite hinges

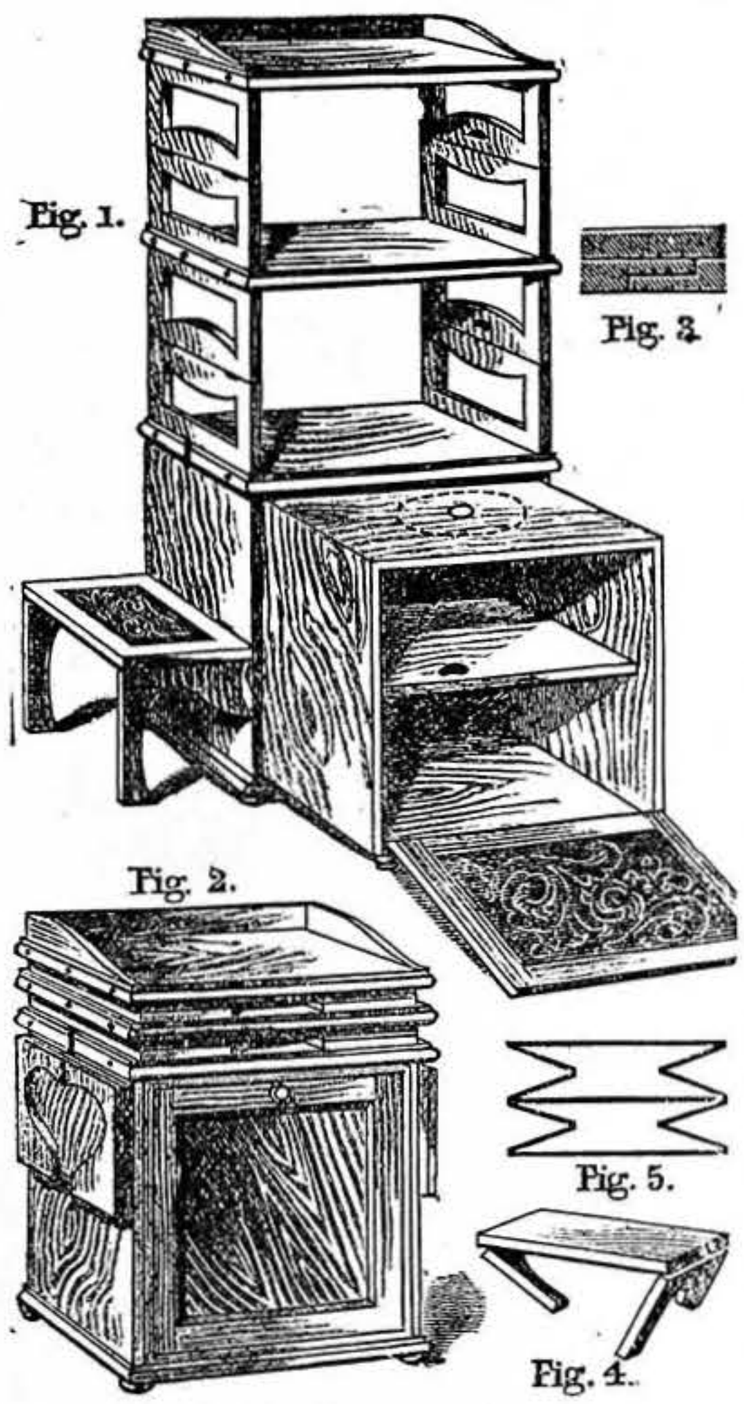

Fig. 1.—Commode, Clothes-holder, and Bed-steps fully displayed. Fig. 2.—Commode entirely closed. Fig. 3.—Bed-step Supports overlapping each other when folded. Fig. 4.—Diagram showing how Bed-step Supports fold. Fig. 5.—Skeleton Diagram, showing how Top Parts fold. Figs. 6 and 7.—Movement to retain Bed-step in Vertical Position.

must be fixed. When adjusting the top part the reverse movement will, of course, be necessary. Flush bolts in either one or both pairs of folding boards will keep them firm. When these boards are raised, if my description is carried out, each bed-step will fall into place independently of further handling—the supports tumbling down as in Fig. 4, provided the hinges work easily. If the height of each support exceeds a half-length of the bed-step, both supports must be made to close over each other as in Fig. 3. In Figs. 6 and 7 is shown the movement which will hold the bed-step in position when folded up. The outside long edge of the latter should just touch the underpart of the top board, and a small part of the top board's edge, exactly in the middle, will be cut flat to allow a short wooden bar (B) to be hinged to it. This bar must be wide enough to cover a portion of each support when folded (if their edges meet). Also in exactly the middle of the edge of the bottom folding sideboard will be inserted a short bar (A), sufficiently long enough to just touch the bar, B. In Figs. 6 and 7 C is a support, D a bed-step, and E the carcase top board. When the top shelves are adjusted the edge of the bottom folding board naturally touches the top board (Fig. 7), and thus the bar, B, is released, and the bed-step and supports fall down by reason of their own weight. Now it is clear that the bar, A, will not pass through a solid board to assume the position in Fig. 7, therefore it is necessary to cut a small piece out of the top board to allow it to do so, remembering the while that care must be taken to leave enough to hold the hinge for the bar, B. It will be best to draw full-size sketches of this part at starting, for you will find it a "ticklish" job. Concerning the main carcase there will be a bottom board, top board, sides, and backboard. A strip of the bottom board will be united to the front of the bottom board of box. Four feet only will be necessary: two at the back and two in front, the latter cut in halves, so that one pair can remain on the main carcase while the other pair travel with the box. Read previous articles for joinery. Of course, you do not want to be told that you can dispense with the clothes-holder, and save a lot of labour thereby; and also have the top board as a lid, and no movable inner box; and you can also have the bed-steps fixed instead of to fold. For sizes, 16 in. square, 24 in. high (main carcase), and thicknesses ¾ in., ½ in., and some much thinner, will give you a foundation to work upon. You can have castors, but I do not advise their use.—J. S.

Oil Varnish.—C. A. (*Hackney, E.*).—The subject of making oil varnish, from some cause quite foreign and strange to those workers who use quantities of it, appears to possess some fascination for the general community, and for readers of Work particularly. I do not think any person, even were he professionally engaged in its manufacture, could give you a receipt for making "1 pint of the very best oil varnish." I would advise you to turn up Vol. I., and read on p. 659 all that bears upon the subject. Then turn to "Shop," p. 511 (same vol.), and read answer to a similar query. The receipt from Spon's "Workshop" vols. is about the most *unworkshop*—if I may so term it—direction that could be published on the subject, and fully bears out the observations of the great varnish firm, quoted on p. 659. Best oil varnishes are, almost without exception, made from *copal* gum—whether the house-painter's "*carriage*," so-called, at 16s., or the coach-painter's genuine carriage varnish, at 30s. to 40s. per gallon. You would therefore require some *copal*. The manufacturers buy gums in large quantities, and sort the light and dark according to their requirements. The light is the scarcest, and hence the dearest. "The *best* varnish" is only a comparative term, and all good varnishes are made for various conditions: some for outdoor work—elasticity; others for whiteness and "hand-polishing;" others, again, for quick and hard-drying qualities; and as all these conditions are effected and governed by the proportions and treatment of the ingredients, you have some notion of the difficulties in the way of making a pint of the best—for what purpose you don't say. Copal is a gum that is very difficult to properly dissolve in oil and turpentine, and to effect the dissolution it is very necessary to have special facilities of heating and special vessels for the purpose; so that even if you were given proportions for any varnish, the chances are still ten to one against your succeeding. "Bloom" is a fault that the best of varnish manufacturers have never thoroughly succeeded in mastering, and therefore how could a novice, with an odd pint, expect to succeed in this respect? whilst with small quantities the purchaser is always at a disadvantage. If any reader can oblige the working "British public" with such a receipt for a pint of best oil varnish that will stand proper tests, he will be their benefactor, without doubt; but as one who has the buying and using of hundreds of gallons a year, I should want to test it myself before accepting it. I will try to contribute a *useful* receipt later on.—Decorator.

Furniture Firms.—W. E. R. (*Penryn*). — So much depends on the class and kind of furniture that you want, that it is impossible to answer your question satisfactorily. Surely, if you are in the furniture trade you do not require to ask the names of wholesale firms. Of course, any wholesale firm will supply furniture "to the trade at trade prices." You had better refer to the advertisement pages of one or other of the periodicals devoted to the trade, and you might as well read the answer to Spot ("Furniture Frames") on p. 260 of Work, No. 68, Vol. II.—D. D.

Chest of Drawers.—F. W. (*London, W.*).—Your question is such a vague one that it is almost impossible to answer it satisfactorily. As you have only a limited quantity of wood, why not make the chest of drawers of dimensions to suit yourself, and not run beyond the wood you have? Assuming that a chest 3 ft. 6 in. wide is what you consider a middling size, make it 3 ft. 6 in. high, and 1 ft. 8 in. from back to front, or thereabouts, and you will not be far wrong.—D. D.

Oak Chest Fittings.—Joiner.—For suitable brass work for your bureau, apply to Grew and Bridge, Summer Row, Birmingham. As they are wholesale people, it is only as a matter of favour that they will supply you, as they probably will if you mention this Magazine. Of course, you can hardly expect them to charge you the lowest wholesale price for such a small quantity as you are likely to require. You might also try Melhuish, of Fetter Lane, E.C. It will be cheaper and better for

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you to buy the brass work than to attempt to make it, as you are not accustomed to the work. Without knowing the design of your oak table, it is quite impossible to supply you with design of chair to match. A moment's consideration on your part would have shown you this. Send a drawing of table, and we will see what can be done to help you.—D. D.

Xylonite or Ivorine.—H. C. (*Birmingham*).—The maker's name and address of this substance have already been given several times in "Shop" as follows:—British Xylonite Company, High Street, Homerton, London, E.—D. D.

Finishing Bookcase.—POLYSMATTER.—There is no "best way" to finish within the limits you name. It is entirely a matter of personal taste whether you finish in natural colour, or ebonised, or walnut, or mahogany. I have never seen fluted glass used for the purpose you name. I do not think it would at all tend to improve the appearance of your bookcase. I decidedly prefer slides to support the writing-flap in a piece of furniture such as sketch shows yours to be. Flaps would be awkward. Their only recommendation is that you might find them rather more easy to make and fit. If you are a fairly skilful worker, though, this consideration ought to have no weight with you. You must please yourself about the use of gilt mouldings if you ebonise the job. You and many others may think them very handsome and nice, while I and many others are equally certain to consider them quite the reverse. D. D.

Polishing Counter.—W. J. G. (*Caversham*).—If you used the beeswax and turpentine in a proper way, you ought to have got a fair amount of polish. I do not, however, consider polishing was at all suitable for such a counter as you name, because the polish is so easily destroyed by moisture. It is not necessary to fill in the grain when the work is to be wax polished, as the wax also acts as filler. If you had told us the kind of wood, and other particulars, we might have been able to tell the cause of failure. Inquiries cannot be answered privately through the post. Glad you find WORK of so much benefit to you in your trade.—D. D.

Tool Chest.—A NEW READER.—Tool chests are so varied in size and fittings, that it is quite impossible to devise one for you if you cannot do so yourself. You know your tools, I do not; so here, at once, you have an advantage over me. As you are a professional mechanic, surely you have ample opportunities of seeing other tool chests. Were you an amateur, I would give you hints, but to offer them to you would be superfluous, for you, no doubt, have your own ideas. As for the tools themselves, I hardly know what to say, but my opinion is that you had better ask your shopmates which is the best place in your neighbourhood to buy tools at. Of course, if all your mates are "puir feckless bodies" too, you can't depend on them; but if, as I take it, there is a canny Scot or two among them, you may as well put yourself under their guidance. Naturally, small ironmongers, as well as large, want a profit, and good tools are not to be bought at low prices. There is certainly a lot of rubbish in the market nowadays, and the way to increase its quantity is by grinding down the retailers' prices. Pay a good price to a respectable tradesman—I suppose there are some in Thirsk—and you will get good tools.—D. D.

Ivory Carving Tools.—T. J. B. (*Shrewsbury*).—You ought to be able to get these through any good tool dealer in your own neighbourhood. If not, Melhuish, in Fetter Lane, E.C., is able to supply them.—D. D.

Covers—Insects in Wood.—H. G. B. (*London, N.E.*).—Yes, covers for binding Vol. I. of WORK have been prepared, and are obtainable for 1s. 3d. each. Get them through your bookseller or newsagent. Your second question is more difficult to answer, for you don't say what sort of insects are in your desk. Are they in the wood, or do they simply make your desk and papers a dwelling-place? If they are in the wood, it is not easy to get rid of them—almost impossible, in fact. The only thing you can do is to wash benzoline into the holes. Other kinds of insects can generally be got rid of by cleanliness and care, as you are no doubt aware. Growl away, if it does you any good. You are not the only one who is given that way. I daresay you will have noticed this, as you are a subscriber from the first.—D. D.

Varnish.—E. L. H. (*Liverpool*).—I am afraid the varnish you used must have been of an inferior quality or wrongly used. If you go to Minton's, or any of the other large paint and varnish manufacturers in Liverpool, you will find there is no difficulty whatever in getting a good clear varnish which will dry hard.—D. D.

Hand Camera.—X. Y. Z.—We will bear your suggestion in mind. The preparation of working drawings to be of value to our readers is a matter of time and skill, which the gentleman alluded to might not find it convenient to supply. This class of instrument, to be really useful, is little more or less than an ordinary small camera in a cover, to attract little attention as possible during use, the plates being contained in ordinary dark slides, the addition of a finder and means of effecting the exposure being arranged on the outside of the case; the lens also being set to bring everything into focus beyond a certain distance. The variation of form and detail, but embodying the above conditions, is simply illimitable. Of course, high finish of a camera for such a purpose is much less needed than for one for ordinary use. If credence was to be placed on the advertisements, we see every maker has the best, provided with a sufficient number of double dark slides. Drawings and description for making have already been given in the first volume of WORK. A lens and instantaneous shuttle and very little knowledge in carpentry would suffice to make a workable instrument. The more unlike any other the better for detective purposes.—D.

Spanner.—E. W. S. (*Eastbourne*).—The spanner is correctly described and fairly drawn in your sketch. It is, I find, stamped "Bauer's Patent," with the No., which is so worn on the spanner I saw that it is unsafe to quote it. I am almost certain I have seen it for sale at a machinist's shop in Church Street, Shoreditch; but I have no doubt that it can be procured by order of any tool-dealer, preferably those serving gas and hot-water fitters. My inquiries have satisfied me that it is a good and useful article.—B. A. B.

Cycles.—PURCHASER OF CYCLE.—The machine from which the design Fig. 3 in June 21st issue was made was of Humber & Co.'s make.—P. B. H.

Fret-working.—ELGEE.—I do not think that you are infringing any copyright in making the things you describe; but even if the idea has been originated by you, I am afraid you would not find it pay you to register the design. There is nothing sufficiently meritorious about it—in fact, the design is in many respects decidedly weak and meaningless. Try and improve, and when you have produced anything really good, offer the design to one or other of the large fret-pattern publishing firms, such as the one you name.—D. D.

Dry Walls.—A. B. (*Renton*) asks if there is a composition to prevent damp from rising. There is not, so far as I know. I think that the house must have been erected without a damp course—that is, a course of pitch and tar well boiled and laid upon the first course of bricks, just above the

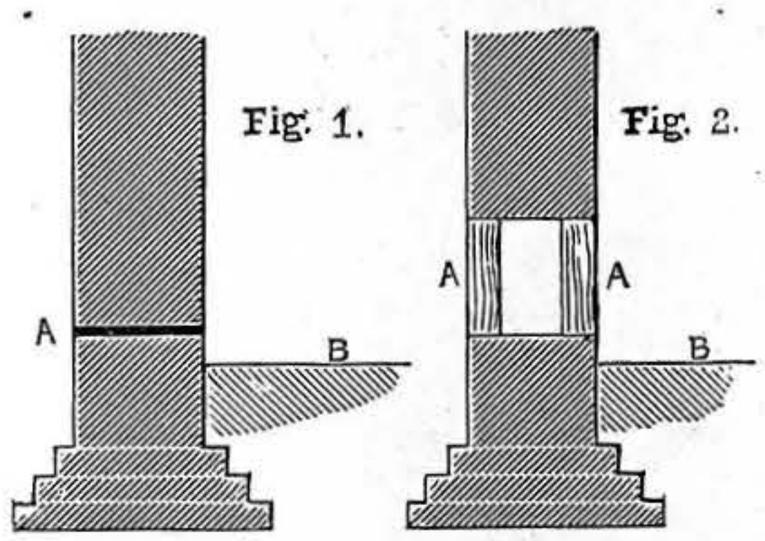

Fig. 1.—Diagram showing Position of Damp Course (A) and Ground Line (B). Fig. 2.—Diagram showing Method of Shoring Old Wall during Insertion of New Damp Course (A) and Ground Line (B).

ground-line. If the house is without a damp course, the best method I can recommend you is to knock the plaster off the wall inside, say for a height from 4 ft. to 5 ft., and face the same with the best Portland cement. If the house you mention has a gable end, the best way to make a good job of it will be to cement it from the apex to the ground with good cement; if this be too expensive, cover the gable end entirely with pitch and tar; and lastly, if this does not remedy, the only way will be to remove two or three courses of bricks and insert a damp course. Now the best material for you to use is roofing felt, laid on boiled tar, as per sketch.—W. B.—[After coating the wall with Portland cement, I should face with Keene's cement, especially if the wall is to be papered. I have treated a battened wall in my own house in this manner with the most satisfactory results.—ED.]

Gum or Resin.—G. R. R. (*West Calder*).—As you do not say for what purpose the varnish is required I am unable to help you so fully as I should like. It may, however, be said that the manufacture of varnish is not suitable work for amateurs. You will do better by putting yourself in communication with a varnish manufacturer, and telling him just what you want. If you get a colourless varnish, you can easily make it any colour you may want by using a suitable pigment or dye. I should say you will get the colour you wish for with picric acid.—D. D.

Model Boat Building.—POGLI.—A paper on the kind of craft you refer to has been ordered from a competent hand.

Putty.—Q. R. S. (*Grays*).—Mix a quantity of whiting into a stiff paste with linseed oil, rubbing and heating it well before using. For particular purposes, as for fanlights, iron-framed greenhouses, and other places where the lap or hold is very narrow, a little white lead may be added to advantage. Coloured putty has a mixture of red ochre, lamp-black, or other colour, with the whiting. Soft putty: 10 lbs. of whiting and 1 lb. of white lead, mixed with the necessary quantity of boiled linseed oil, adding to it ½ gill of the best salad oil; the last prevents the white lead from hardening.—Y.

Writing-desk.—SECOND HAND.—The initials on the plate of your writing-desk cannot be well erased without removing the plate, unless you are prepared either to sacrifice appearance or to rub down the surrounding woodwork to the same level. I think you will probably be able to remove the plate without injuring the surrounding wood if you heat it. The heat will probably melt, or, at any rate, soften the cement with which the plate is fastened down. If you injure the wood, you will have no difficulty in concealing defects by the use of stopping. Probably, a new plate would cost so little that it might not be worth while preserving the old one.—D. D.

Waterproofing Canvas.—E. H. (*Hampstead*).—To render tents waterproof, they may be coated with boiled linseed oil and terebin, 1 gill of the latter to 2 quarts of oil, two coats being sufficient.—Y.

Saw Sharpening.—Q. R. S. (*Grays*).—Use a triangular file, and sharpen *every other* tooth on one side first, then proceed in the same way on the other side; after that, use a saw *set*, with which every other tooth on one side first, and then the other side, are slightly bent, so as to make the teeth *clear* their way through the wood being cut. In some instances, if the teeth are uneven on the points the file is run along them before commencing to sharpen the teeth, so that they may all be of equal length.—L. Y.

Ship and Naval Craft.—There are no books or periodicals published that would help you. You cannot do better than write for all information as to the classes at the School of Naval Architecture, South Kensington Museum, London, S.W.—Y.

Fire-grate.—ONE IN A FIX.—A good deal must depend on circumstances, which I am, of course, unacquainted with, as you do not tell me anything about them. I think, however, as your object seems to be to increase draught, that the best way will be to bring in the fresh air below the fire.—D. D.

Folding Screen.—INVALID.—To make a screen draught-proof at the folds, use a rule-joint hinge. As these are somewhat costly, you may prefer to effect your purpose by simply tacking a piece of cloth, or something similar, over the joint, leaving sufficient fulness to allow the screen to be folded.—D. D.

Luminous Paint.—R. E. D. (*Gateshead*).—In answering, to the best of my knowledge, your question—which is of more than individual interest—I may mention that a short notice of this article is given in No. 42 of WORK (Vol. I., page 662). I draw your attention to this, and the name of agent therein given, as I think you will probably find your best and cheapest course to be the direct purchase of the paint. The following particulars of Balmain's luminous paint may not have come to your notice. The basis of Balmain's paint is calcium sulphide, prepared by subjecting calcium sulphate (plaster of Paris), mixed with one-third its weight of charcoal, to a strong heat. Both substances should be previously finely powdered and well mixed together, and a conveniently sized fire-clay crucible is necessary for the heating. To make it into paint, take fifty parts of the prepared calcium sulphide (CaS) and four parts of bichromate of potash, and grind thoroughly together, and then convert into liquid paint form by adding good "outside copal" oil varnish. Another receipt I append: Take thick oyster-shells; clean, and burn them until red-hot. Break them up when cold, and sort out the black-looking and darkest portions. Pound up the remaining shells to a fine powder form, and then place alternate layers of this and flour of sulphur to within an inch or so of the top of crucible, the layers being some half-inch in thickness. Fill to the top of crucible with well-kneaded clay, and let it become hard by gentle heat. Then place the crucible on a fire, and endeavour to get the whole to a dull blood-red; and then try to keep it so, by careful attention, for not less than one hour, and longer, if the clay well seals it up. Set aside to cool gradually, and then reduce its contents to a fine powder. This should result in a bright blue luminous paint. Mix with gelatine and water solution, or gum Senegal solution, if required for indoors, and for outdoors the above *best* varnish; or boiled oil and turpentine will answer in good drying weather, used in about equal parts. If this is required for your gate or railings, have the iron-work well scraped and free from rust, and well coated with a common *oxide* paint before using the luminous compound. White-lead paint would not answer so well; the luminosity stands best on oxide. I hope this may be of some use to you, and point out in what respect your experiments have been wanting.—F. P.

Whitewashing, etc.—INQUIRER.—I am surprised that, having taken WORK monthly from the first, you have learned so little of the above subject. No. 50 (Vol. I.) contains a long article on distemper and its practical applications, whitewashing being the lowest or commonest phase of the subject. I will, however, try to assist you, in face of your long and carefully written inquiry. Now, the good, solid-looking jobs cannot be done with common lime; but you must get its *carbonate*, viz., common whiting, for the basis of your mixture. Although lime, freshly slaked, may answer for a time, it will peel off, as you know, after accumulated coats, no matter whether it be called lime, or sold, with a fanciful name, as a "patent distemper." To get a good job of distemper, *all* old lime must be thoroughly scraped off; and when you do this on a few jobs, you will

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wish you had never put lime on. If you only take off the loose places no matter how well you make or spread the proper distemper—these patches will surely be noticeable, being either a different colour, or else showing the shade from a different plane or level of surface. I give you instructions for both new and old jobs. *For new plaster*, if the price will stand it, after stopping all cracks, etc., coat with a fairly strong mixture of warm size, with a very little whiting in it, just to tint it; then soak the whiting in water, putting the former into the latter; pour off all surface water; well stir with the hand and arm, and add the *warm* size: never use it hot unless specially instructed. If you cannot get and keep patent jellied size, try Cannon's concentrated powder. The *best* glue will answer, however, if prepared thus: put to soak in cold water overnight; then, next day, break up with the hand, and treat it just sufficiently to mix the glue and water thoroughly. Adding "hot glue" will spoil any distemper; common glue or common "size powders," so-called, will also make any mixture turn out "stainy." For tinted whitewash ("distemper"), add the stainer or pigment, whether lime blue, Venetian red, or ochre and umber, to the slaked whiting, and well mix with the same *before* adding the size. Mix the pigment with a little water first; don't put it into the whiting in a dry form. When made, let it cool before using; it will then be set, and will want a good brush, not a thin "rag of a thing," to spread it. *For old work*, if you can't scrape all the dirt and lime off, take the loose off, and coat with the size coating, as above. You may then spread the jellied whitewash with comfort, and with less fear of stains. Before re-coating proper distemper work, the old distemper ought always to be washed off; this is much easier to do than scraping lime off. Ceilings may be done once or twice without washing off; but the results are only "cheap," and often "nasty." Soft soap is quite unnecessary. With pains and patience, combined with practice, you are bound to succeed.—DECORATOR.

Lantern Slide Painting.—E. D. B. (*London, N.*).—Ordinary oil colours, such as are sold in tubes for the use of artists, do for lantern slide painting. Only those that are transparent, such as Antwerp blue, viridian, rose madder, raw sienna, carmine, and yellow lake, must be used, as all you require to do is to stain the surface of the glass. An excess of pigment, or the use of opaque colours, would prevent the light shining through the colours, and giving a reflection on the screen. Mix the colours with amber varnish, and apply with camel-hair brushes, putting the colours on evenly and thinly. The use of the finger to blend and soften the tints is to be recommended; and skilful lantern slide painters do a great deal by dabbing the tints with the broad part of their finger. A soft kid glove also is used on the finger. You had better practise on a piece of glass the laying of skies and flat tints, until you can do it fairly well. Clouds are taken out of a tint of blue with the finger. Photographs on glass, or positives, are largely used now, and colour admirably.—F. M.

Marble Black.—S. P. (*Middlesboro'*).—Although the size and shape of the articles would have been useful for me to know, I think you can easily obtain what you require. As, I conclude, you are not afraid of soiling your fingers, I would suggest mixing lamp-black with cold water, and using the black fluid instead of plain water for the plaster castings. Of course, this would only result in a *grey;* but it is a better ground than white to finish upon. You may then give the castings, being quite dry, a couple of coats of French polish or patent knotting. This will stop the suction of the plaster. Three coats may be necessary to do this, and it must be spread quickly and carefully, in order not to roughen the surface or damage the sharpness of the casting. When the suction is thus stopped, you will probably find the black enamel a ready and effective finish. The ordinary "tin enamels" of the quick-drying sort are rather prone to crack, however, so you may desire some other more reliable finish. French polishing with the rubber would be best, if the article was of a nature to be so rubbed; but a small, intricate casting would have to be done with a camel-hair brush. If it were desired, black could be added to the polish, or you could coat the casting with *ebony* water-stain before knotting and polishing. The most permanent finish on *broad* work would be coating with "ivory black" flat paint, next three or four coats of "polishing copal" varnish, and then polished to the real marble gloss with a piece of felt, sweet oil and rotten-stone, or putty-powder. I hope this will be useful.—T. P.

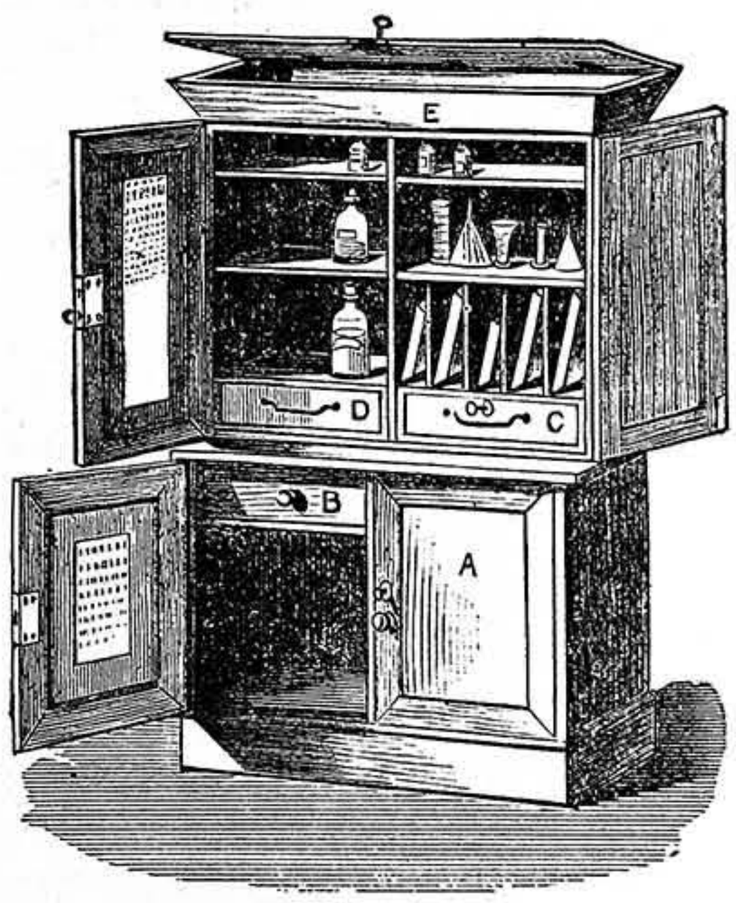
Fret Machine.—F. C. (*Belfast*).—I can see very plainly where you are wrong, and I will do my best to help you; but at the same time I do not like the tone of your letter. In the first place, you say you have made a machine according to my instructions exactly. I say you have not, and that is where you are wrong. For a spring I use indiarubber, that being my instructions given. I find it more suitable, because you can increase or decrease the strain upon the saw at pleasure by putting more on or taking some off. If you follow out the instructions given, the machine will work. The one I use is precisely the same as given, and answers my purpose. You must increase your spring power. Fret saws will stand a very great strain. You say that myself and friends extolled the above machine to the skies. Yes, and will still continue to do so, for we know its value.—J. D. W.

Zither.—H. L. (*Carlisle*).—You ought to be able to obtain what you require at almost any good musical instrument shop; but if you still wish for my assistance in the matter, I should be very happy to give it and help you to get what you want. The cost of an instrument suitable for your requirements would be about two guineas, and tutors may be had from 2s. 6d. upwards. The Editor has my address, which I have no doubt he will let you have if you send a stamped addressed envelope.—R. F.

Dulcimer Wood.—C. B. A. (*Streatham*).—A complete set of wood for an F dulcimer, as described in "The Dulcimer: How to Build One," Vol. I. of WORK, would be about 7s., or, including bridges, sound-hole rings, feet, and stand, about 10s. 6d. The thicknesses given are for rough stuff, except where otherwise stated. It would be a decided improvement if you used all yellow pine for back braces, etc., on account of its greater sonorosity, the only drawback being its greater cost. The joint in the back runs from side to side, but if you used pine you could get it wide enough to dispense with this joint, which would be a further advantage. Send to Chilvers & Co., St. Stephen's, Norwich, for their price list of fittings, etc.—R. F.

Dulcimer.—CAWD-HUD.—If you refer to WORK, Nos. 31, 38, and 41, you will find full information concerning dulcimers.

Photographic Cabinet.—E. W. N. (*Cheltenham*).—The following is a design for a useful cabinet or chest, the dimensions must of course be suited for the size of the bottles, dishes, etc., it is to contain: the advantage of the cabinet over the box form is that it is not necessary to remove one article to get at another. The top is made with a



Photographer's Cabinet—A, Camera Cupboard; B, Cloths and Brush; C, Poisons; D, Scales; E, Paper.

lid, and forms a useful receptacle for sensitised and other papers: the extreme height need not be more than 5½ ft. In a drawer labelled "poisons" may be kept the more dangerous or valuable chemicals, such as cyanide or gold chloride. One side of the lower part is devoted to cameras and dark slides; on each door is affixed a list of the contents of each special cupboard, which can be added to or altered according to circumstances. The whole forms a compact receptacle for everything required by an ordinary amateur, who takes a pride in his belongings; and as to the size, it may be made to suit the size of the apparatus used, and has the advantage of showing the contents at a glance. In fitting a cupboard of this kind, bottles of different capacities and uniform in shape should be obtained, with a few spare bottles.—D.

Films from Negatives.—TED.—The best method to remove the films from their present support is to place the broken negative in a dish, face upwards, containing weak hydrofluoric acid. In a short time the film will easily separate from the glass, and must be carefully removed to another dish, considerably larger than the film, of clean water: another piece of thoroughly clean glass being introduced beneath the film, which can then be adjusted on to the glass, and the two gradually lifted out of the water edgeways together. This must be done slowly and carefully: the water will then run out from between the surfaces, and all that remains to do is to place them on a rack to dry. See that the film is placed on the glass right side outwards, or the negative will print reversed, which would be unsuitable for anything besides carbon printing or transparency making. Blisters occur on papers with a highly glazed surface when they are newly albuminised. Too much difference in temperatures of the fixing and washing baths, and too strong solutions of hyposulphite of soda, will cause them. Prints on paper disposed to this fault should be taken out of the printing frames and immersed for a few minutes in good methylated spirit *before* being moistened with water, or any other solution it may be intended to use. After this spirit-bath the other processes may go on as usual.—D.

Varnish.—E. W. N. (*Cheltenham*).—A very good varnish may be made by diluting the best white hard spirit varnish obtainable at the oil and colour shops with good methylated spirit to a proper thinness, or 6 oz. of orange shellac and ¼ oz. of sandarach (roughly powdered) mixed with as much silver sand placed in a half gallon bottle and filled up to the shoulder with best methylated spirit. Let this stand in a warm room for a week, shaking it well up daily; then let it stand to settle, and pour off the clear portion and filter through blotting-paper. This makes a very hard serviceable varnish, not tacky or liable to scratch.—D.

Staining Fishing-rods.—ANGLER.—A useful brown stain for these is given in the issue of Sept. 26th, No. 132, p. 439, under heading of "Means, Modes, and Methods." Another plan is to mix vandyke brown into a paste with liquid ammonia, and thin down with water till the required shade is obtained. As you appear to have no experience in French polishing, the next best thing to do is to apply the French polish with a camel-hair brush—a polish made by dissolving 3 oz. of best orange shellac in half a pint of methylated spirit will suit. If, however, a brighter finish is required, make and use a varnish as advised in "Shop"—"Varnish for Walking Sticks" (No. 131, p. 429, Sept. 19th issue).—LIFEBOAT.

Boat Propeller.—T. B. W. (*Bradford*).—Respecting the model of your pleasure-boat, there seems very little merit in the idea you have suggested for propelling the same. In the first place, the method you have adopted for fastening your apparatus to the boat's keel would obviously impede the boat's progress through the water, which would be a serious objection in the case of either a lifeboat or pleasure-boat, speed being more or less essential with both. Then again, one of the pleasures of boating consists in two or more "oars" being jointly engaged. Your arrangement admits of one person only, besides which, the length of your propellers is such that only one set could be fitted to any boat, as they would catch each other. Generally your idea is most impracticable, and you would be only wasting time to attempt to carry it out, to say nothing on the score of expense.—C.

Printing Patterns for Crewel Work.—J. H. (*Stockport*).—The patterns on paper for transferring to the material by use of a hot iron are printed in white wax with which a suitable pigment has been ground up. I am not aware that in printing patterns direct on the material, any particular process is resorted to.—S. W.

Circular Frames.—T. H. T. (*Blyth*).—Apply to any wholsale dealer in picture frames or mouldings. Perhaps you might meet with a turner in your own neighbourhood who could make them.—D. D.

Carpentering.—J. T. G. (*Norwich*).—As you have only just begun taking WORK, your best plan will be to get all the previously published parts and read the numerous articles on cabinet making, joinery, and carpentering which have appeared. There is no one article nor series of articles which gives all the rudiments of woodwork, as a moment's consideration must show you; this would be impossible. A very large proportion of WORK is taken up with articles on working in wood, and there is scarcely a number from which you could not learn much. By the way, it is hardly so much information on what is generally regarded as carpentering or joinery as on cabinet making that you want.—D. D.

Turning Designs.—T. D. (*Liverpool*).—I do not know of any good turning designs being published. There were some mentioned in our "Guide to Good Things" (WORK, Vol. II., p. 90) which I should think would be much better than the wretched design you enclosed. The address for those I recommend is: F. G. Walker, 21, St. Helen's Street, Ipswich, and the price is 1s. 7d. Any effort to design your own patterns is of benefit, and to buy a turned article, and copy or modify it, is better than buying a drawing.—B. A. B.

Specifications.—DOUBTFUL.—A provisional specification is required by the law to contain the title of the invention, and to point out the nature of the invention, fairly, no doubt, but in its rough state, until the inventor can perfect its details, which has to be done in the complete specification, and everything made perfectly clear, so that at the expiration of the exclusive right the public may be able to use or practise it with the same facility the inventor has done. Under the new Act of 1883, the provisional specification is only published with the complete, and if the complete is never filed, the provisional is never published. From our correspondent's remark that he has recently *filed* a provisional, we should judge that he is doing the work himself, in which he has evidently had no experience, or he would know that a provisional specification is *lodged*, and that a complete one is *filed*. If our correspondent has a plan, machine, or system, that is *novel* and *useful*, he will scarcely, in our opinion, succeed in creating a legal property of it by his own unaided exertions, and if it is likely to prove of value, he will find it a very ill-judged course for him to pursue. If he will refer to No. 44 of WORK, Vol. I., p. 694, he will there find information on the subject of patents, of which most

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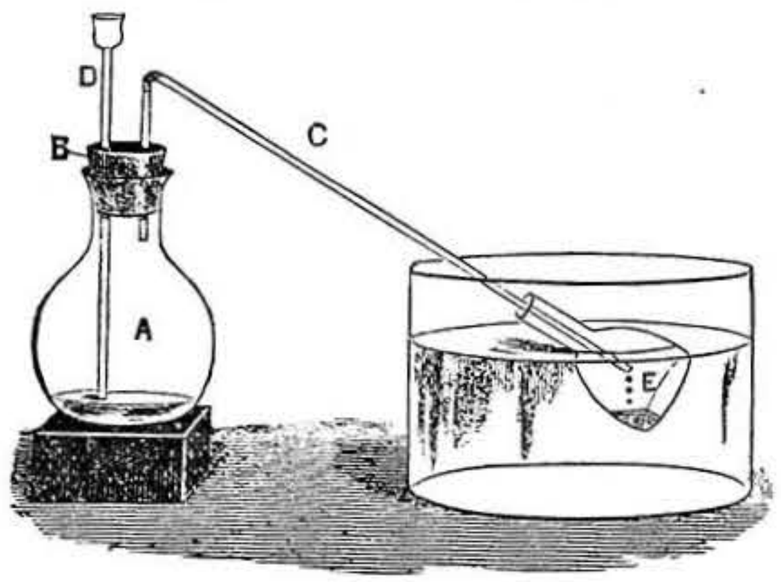
inventors and the public in general are entirely ignorant, but which, if carefully studied, should be of great use to him. Without our seeing the provisional, and knowing what the sweeping alterations he mentions are, we are not in the position to give him any useful advice under the circumstances named. The particulars referred to as being found in No. 44, Vol. I., are too long to reproduce here, and if our correspondent has the first volume he can readily refer to it.—C. E.

Bromine.—PROBYN.—Free bromine can easily be obtained from ammonium bromide or cadmium bromide by mixing them with the black oxide of manganese, and distilling with sulphuric acid. 2½ parts by weight of ammonium, or cadmium bromide, are well mixed with 1 part of manganese dioxide and the mixture placed in a flask (A), which should be provided with a well-fitting cork, or caoutchouc stopper (B), through which the end of a bent tube (C) projects a little way, and through which there also passes a funnel-head tube (D), which reaches nearly to the bottom of the flask. 2½ parts of sulphuric acid are now poured down the



Apparatus for making Bromine—A, Flask; B, Cork or Caoutchouc Stopper; C, Delivery Tube; D, Acid Safety Tube; E, Condensing Flask.

funnel tube into the flask, which is then very gently warmed. Free bromine is liberated, passes down the delivery tube (C), and should be collected as a dark reddish-brown liquid in a flask or bottle (E), surrounded by the coldest water procurable. See that the cork in the flask fits well, for bromine has a very strong odour, and its vapour is suffocating and very irritating, and also see that the tube (D) dips below the acid in the flask.—F. B. C.

Table Alteration.—W. C. (*Hurst, Berks*).—Not knowing exactly what your round table is like, or what the pedestal is, I cannot advise you else than to leave it as it is, or make a dining-table with semi-circular ends, supplying a rectangular piece which I should fix to the pedestal, supporting the semi-circular ends on slides, and a leg, or two legs, to each. The extension possible would not be great, say about equal to a circumscribed square to the circle of present table, or perhaps a little more. Considerable ingenuity would be required to make a successful job, but I see no other use for an old loo table if altered.—B. A. B.

Damaged Waterproof.—W. G. C. (*Sierra Leone*).—Under the circumstances stated there is no remedy but cutting out the entire part that is damaged, and all that part to which the liquid has reached where at present no damage is apparent. Then get a piece of the same kind of waterproof, and let it be 1 in. larger all round than the space included in that of the removed portion. Having trimmed the opening neatly to a round, square, or other suitable form, stretch the sheet evenly on the floor with the proofed surface under, and with some rubber solution paint the edge of the opening all round with a width of 1 in. Over this lay the part to be inserted, and when it is placed in its proper position press it down over the joining with a heavy flat iron, and iron it down all round so as to get all the air out and bring the parts into close contact. If properly done, it will, when dry, be found a good job, and the sheet as good as ever, except that the double thickness at the edges of the patch will show what has been done. There is no means known by which the surface can be renewed or restored to its pristine state.—C. E.

Hydraulic Propulsion.—C. Y. H. (*Smethwick*).—When our correspondent has brought his "idea" into a *practical* form, either in a *model* or in a set of *drawings*, showing its practicability, he will *then* have something tangible to deal with; otherwise, the "idea" is of no benefit to anyone, and cannot in that state be treated or dealt with. The steering by means of the propelling power is not by any means new. We travelled on the Thames nearly forty years ago in a boat propelled by a jet of water, and by inclining the jet to the right or left the boat was made to answer the helm. Years before this a screw propeller was arranged so as to be turned right or left, and thus steer the boat or vessel, and we think it was patented, but the complication and wear and tear seem to have acted prejudicially to its introduction, and we believe it was never developed further than being fitted in a small launch. Our correspondent will only be wasting his time in trying to get anyone to join the "idea." When he has provided the means of demonstrating the correctness of his "idea," and brought what is at present imaginary into the condition of being an actuality, he will then have some basis to work on which he has not at present, and cannot have whilst he cannot show that the "idea" is practicable.—C. E.

Iron Safety Bicycle Frame.—W. W. (*Manchester*).—A safety frame built of iron pipes is generally much heavier than that with steel tubes. Iron pipe is only put into the cheapest machines, which are so roughly finished that the tubes show lines all along and a furrow where the tube has been joined in making. By moving the hand round the tube a lumpiness will be felt which is entirely absent in weldless steel tube.—A. S. P.

Rocking Cradle.—FATHER.—I cannot undertake to teach you how to rock a child's cradle in WORK, or devise any method "whereby a cradle would rock itself when started for from ten to fifteen minutes." You will find a reply in "Shop," in No. 50, relative to a wooden swing cradle; another in No. 161, on a child's cot that does not rock, and another on a child's rocking boat in No. 102. There is also a fourth in No. 122 on a swing bassinette.

Incubator.—G. R.—I am glad to say that the promised paper on the Atmospheric Incubator has reached my hands, and will appear as soon as possible—that is to say, in December, which is the earliest possible time that arrangements already made for the appearance of articles in hand will permit.

Monogram.—W. K. G.—I am sorry to disappoint you, but the demands on "Shop" space are far too great to allow me to give any more monograms for the present, at all events.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Bending Metals.—J. C. (*Scarboro'*) writes:—"Would any readers give me information as to the best method of bending steel or brass beading (½ in.) for fenders, ashpans, etc.?"

French Medal Glue.—ESOR writes:—"Can any of your readers inform me as to the best method of preparing French medal glue for use on wood, and for keeping a quantity always ready for use where about 28 lbs. are consumed per day? Does glue, by being kept boiling hour after hour, lose any of its intrinsic qualities?"

Re-transfer Ink.—LITHO writes:—"Would any reader of WORK tell me the way to make re-transfer ink from plate to stone?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Wicker Stains.—F. H. (*London, S.W.*) writes, in reply to A. B. (*Westminster, S.W.*) (see page 462, No. 133):—"You should wash the wicker chair quickly with strong soda water, and then rinse it off with plenty of clean water, under a tap if possible, then stand it in the sun to dry. When quite dry stain the worn parts with burnt umber, or if red, with burnt sienna (ground in water) and a little stale porter. When this is dry, varnish the whole of the chair with brown hard varnish, and it will look as good as new. The varnishing must be done quickly; do not go over it twice, or attempt to smooth it, as it were, but when once on, let it remain until quite dry."

Black Varnish.—M. (*Bishop Auckland*) writes, in reply to CARADOC (see page 446, No. 132):—"One of the cheapest varnishes for iron is tar varnish. It is made by boiling gas tar and asphalte, and well stirring till melted; then take it from the fire, and mix with mineral naphtha. The boiling and mixing must be very carefully done, as it is very liable to take fire. A piece of wet sacking is generally kept in readiness for such an emergency, when it is put over the mouth of the pan. As the price is low, I should advise purchasing it ready made, rather than run any risk."

Pumps.—M. (*Bishop Auckland*) writes, in reply to J. H. (*No Address*) (see page 398, No. 129):—"You will find sections and descriptions of engines, pumps, etc., in 'The Model Engineer's Handybook,' by P. N. Hasluck."

Bath Heat.—M. (*Bishop Auckland*) writes, in reply to ROUND O (see page 414, No. 130):—"If you write to Mr. T. Fletcher, of Warrington, he will supply you with a gas-heater to heat the water as it runs into the bath."

Indiarubber Mat.—M. (*Bishop Auckland*) writes, in reply to ROUND O (see page 414, No. 130):—"You might try the cement used for fixing the tires on bicycle wheels."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—H. E. P. (*Plaistow*); R. L. T. (*Plumstead*); D. G. C. (*Bradford*); A. W. B. (*Bristol*); J. G. (*Hull*); H. S. (*Ponder's End*); H. B. S. (*Liverpool*); J. M. M. (*Bristol*); J. E. B. (*Chesterton*); H. T. M. (*Acton*); G. P. (*Elgin*); J. P. A. (*Walthamstow*); WOODWORKER; WATER ASPIRATOR; J. R. (*New Brompton*); SEA GULL; E. R. D. (*Sherborne*); H. A. H. (*Ryde*); C. E. T. (*Liverpool*); AIR PUMP; E. E. S. (*Newton Abbot*); G. M. L. (*Selborne*); A. E. T. (*Bury*); R. W. C. (*Douglas*); CARVER; G. P. (*Elgin*); C. A. P. (*Finsbury*); R. G. H. (*Birmingham*); J. A. (*Gristhorpe*); J. P. (*Hastings*); T. B. B. (*Manchester*); FOUNTAIN; W. H. P. (*Tottenham, N.*); E. G. F. (*Bermondsey*); J. (*Durham*); F. S. (*Kidderminster*); R. H. (*Blackpool*); J. T. (*Whiston*); A. N. (*Horwich*); J. O. R. (*Whitcombe Magna*); W. L. (*Dalston*); G. B. (*Paisley*); G. A. (*Hornsey*); H. D. (*London, S.W.*); H. H. M. (*St. Leonard's-on-Sea*); T. R. (*Walthamstow*); LABOUR; M. B. (*Chelmsford*); KERNEL; R. N. (*Grays*); A PUZZLED ONE; L. M. (*Oldham*); T. M. (*Liverpool*); E. C. O. (*Tottenham*); J. J. M. (*Liverpool*); E. H. (*Kingsland*); F. S. (*Reading*); C. M. W. (*Dulwich*); J. M. P. (*Nottingham*); G. F. C. (*Southampton*); COMMUTATOR; WHEELER; T. H. C. (*Stroud*); A. H. (*Woolwich*); A. W. (*Stoke-on-Trent*); H. H. (*Burton-on-Trent*); DRAUGHTSMAN; A. H. K. (*Pendleton*).

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Joiners' Tool List, post free.—BOOTH BROTHERS, Dublin. [21 R

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